

A II-ik nemzetközi Congressus magyar bizottsága.

HUNGARIAN COMMITTEE OF II. INTERNATIONAL ORNITHOLOGICAL  
CONGRESS.

(Budapest, Hungarian National Museum.)

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Professor G. Bowdler Sharpe

from his friends

A REVIEW by the Author

578.208

N.H.

OF

## RECENT ATTEMPTS TO CLASSIFY

## BIRDS;

AN ADDRESS

DELIVERED BEFORE

THE SECOND INTERNATIONAL ORNITHOLOGICAL CONGRESS

ON

THE 18TH OF MAY, 1891,

BY

R. BOWDLER SHARPE, LL.D., F.L.S., ETC.

(ZOOLOGICAL DEPARTMENT, BRITISH MUSEUM.)

BUDAPEST

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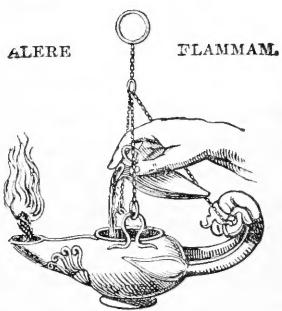
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# THE CLASSIFICATION OF BIRDS.

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COLLEAGUES,—

It was at first my intention, in addressing you at the present Congress on the Classification of Birds, to have laid before you a brief history of Ornithology from the time of Linnæus to the present day. I found, however, that this has been so admirably done by Professor Alfred Newton in his article "Ornithology," published in the 18th volume of the 'Encyclopædia Britannica,' that to have attempted such a task would have involved me in the most barefaced plagiarism; and, even if this crime had been condoned, I should have been unable to teach you anything that you have not already learnt from his more talented pen. From the time of our great master, Linnæus, and even from that of the patriarchs of Science, Professor Newton traces the gradual development of Ornithology; and not only do I find little to add to this masterly treatise, but my very criticisms are there forestalled, and I offer this tribute to the genius of my talented countryman, not without a slight feeling of envy at the vigorous English in which the memoir is composed, and the truly wonderful way in which his facts are marshalled and arranged. With some regret, therefore, I have laid aside my exposition of the various schemes of Classification which I had intended to place before you, because I feel that I could not say anything which Professor Newton has not said ten times better; and although his article may not be "milk for babes," by the earnest devotee of Ornithology it will be read with intense interest.

Since the article appeared in 1884, however, some considerable additions to our knowledge have appeared in print, and I propose to-day to invite your attention to these important events in what may be deemed the "Evolutionary" period in the history of Ornithology.

There seem to be three great Epochs in the history of our Science, which we may call the Linnean Epoch, the Cuvierian Epoch, and the Darwinian or Evolutionary Epoch.

*The Linnean Epoch (1735-1800).*

In this time the Science was reduced to order, for the successors of Linnæus did but incorporate the additional material which accumulated through the works of Daubenton, Buffon, Latham, and others, the results being always summarized on the Linnean plan.

*The Cuvierian Epoch (1800-1860).*

The activity of the French naturalists in the early part of the present century was so marked, and the calibre of the zoologists of France was so overpowering, that the Paris Museum became the centre from which most of the ornithological work of those days emanated, while the voyages undertaken by the French Government resulted in an accumulation of specimens which was not to be rivalled in the national museum of any other country. Besides Cuvier himself, there were several of his pupils and contemporaries who outstripped him in ornithological knowledge, and in 1889 I saw in the hands of Mr. Boucard the correspondence of Vieillot with the Comte de Riocour, showing that the former must have been a man of wide ornithological knowledge, as indeed his articles in the 'Nouveau Dictionnaire' prove him to have been. With Vieillot, Levaillant, and Lesson at work in France, a great deal was accomplished ; but the chief interest, so far as concerns our present subject, centres round the classification of Cuvier, which, in spite of slight modifications, prevailed down to modern times, so that we find Dr. A. R. Wallace, in 1874, still talking of naturalists "who have only just freed themselves from the trammels of the old 'rostral' system."

Full justice has been done by Professor Newton to the memory of Illiger, whose "classification was quite new, and made a step distinctly in advance of anything that had before appeared." His 'Prodromus,' published in 1811, received far less recognition than it deserved ; for besides his explanation of the technical terms of Ornithology, his classification was a truly scientific one, with diagnostic characters for orders, families, and genera. Illiger's work, as well as that of other famous German naturalists, such as Merrem, Nitzsch, and Johannes Müller, was strangely overlooked in England, principally because our leading zoologists were exercising themselves over the precious "quinary" system, while the energies of men like Gould, Jardine, and others were devoted more to the production of illustrated Faunal and monographic works. The later adoption of Cuvier's method by George Robert Gray in the 'Genera of Birds' has doubtless been the reason why his classification has <sup>been</sup> followed down to recent times.

*Darwinian Epoch (1858 to the present day).*

Living as we do in the days when most of us test the result of our work by the theory of Evolution, it is not necessary to say anything of my own on the early development and spread of our thoughts and ideas on this subject. The following paragraph in Professor Newton's article embodies all that is necessary to say on this head:—

"There is no need to enter into details of the history of Evolution; but the annalist in every branch of Biology must record the eventful 1st of July, 1858, when the now celebrated views of Darwin and Wallace were first laid before the scientific world, and must also notice the appearance towards the end of the following year of the former's 'Origin of Species,' which has effected the greatest revolution of human thought in this or perhaps in any other century. The majority of biologists who had schooled themselves on other principles were, of course, slow to embrace the new doctrine; but their hesitation was only the natural consequence of the caution which their scientific training enjoined. A few there were who felt as though scales had suddenly dropped from their eyes, when greeted by the idea conveyed in the now familiar phrase 'natural selection'; but even those who had hitherto believed, and still continued to believe, in the sanctity of 'species,' at once perceived that their life-long study had undergone a change, that their old position was seriously threatened by a perilous siege, and that to make it good they must find new means of defence. Many bravely maintained their posts, and for them not a word of blame ought to be expressed. Some few pretended, though the contrary was notorious, that they had always been on the side of the new philosophy, so far as they allowed it to be philosophy at all, and for them hardly a word of blame is too severe. Others after due deliberation, as became men who honestly desired the truth and nothing but the truth, yielded wholly, or almost wholly, to arguments which they gradually found to be irresistible. But, leaving generalities apart, and restricting ourselves to what is here our proper business, there was possibly no branch of Zoology in which so many of the best informed, and consequently the most advanced, of its workers sooner accepted the principles of Evolution than Ornithology, and of course the effect upon its study was very marked. New spirit was given to it. Ornithologists now felt that they had something before them that was really worth investigating. Questions of Affinity, and the details of Geographical Distribution, were endowed with a real interest, in comparison with which any interest that had hitherto been taken was a trifling pastime. Classification assumed a wholly different aspect. It had up to this time been little more than a shuffling of cards, the ingenious arrangement of counters in a pretty pattern. Henceforward it was to be the serious study of the workings of Nature in producing the beings we see around us from beings more or less unlike them, that had existed in bygone ages, and had been the parents of a varied and varying offspring—our fellow-creatures of to-day. Classification for the first time was something more than the expression of a fancy. Not that it had not also its imaginative side. Men's minds began to figure to themselves the original type of some well-marked genus or family of birds. They could even discern dimly some generalized stock whence had descended whole groups that now differed strangely in habits and appearance—their discernment aided, may be, by some isolated form which yet retained undeniable traces of a primitive structure. More dimly still, visions of what the first bird may have been like could be reasonably entertained; and passing even to a higher antiquity, the Reptilian parent whence all Birds have sprung was brought within reach of man's consciousness. But, relieved as it may be by reflexions of this kind—dreams some may perhaps still

call them—the study of Ornithology has unquestionably become harder and more serious; and a corresponding change in the style of investigation will be immediately perceptible."

In 1867 Professor Huxley promulgated his celebrated 'Classification of Birds,' and this has been universally recognized as an epoch-making memoir in the history of Ornithology. In dealing with the Classifications of the last twenty-five years, I may be allowed to refer to a few of them in detail, and no sketch of the classificatory schemes of the Darwinian epoch would be complete without an epitome of Professor Huxley's Classification, the publication of which had immediate and far-reaching effects. I have also incorporated the results of his later memoirs.

Order I. **SAURURÆ**, Haeckel.

Genus 1. *Archaeopteryx*.

Order II. **RATITÆ**, Merrem.

1st Group.

Genus 1. *Struthio*.

2nd Group.

Genus 1. *Rhea*.

3rd Group.

Genus 1. *Casuarius*.

2. *Dromæus*.

4th Group.

Genus 1. *Dinornis*.

5th Group.

Genus 1. *Apteryx*.

Order III. **CARINATÆ**, Merrem.

Suborder I. DROMÆOGNATHÆ.

Family 1. TINAMIDÆ.

Suborder II. SCHIZOGNATHÆ.

Group 1. **Charadriomorphæ**.

Family 1. CHARADRIIDÆ.

2. SCOLOPACIDÆ.

Group 2. **Geranomorphæ**.

Family 1. GRUIDÆ.

Intermediate forms: *Psophia*, *Rhinochetus*.

Family 2. RALLIDÆ.

Intermediate forms: *Otis*, *Cariama*.

Group 3. **Cecomorphæ**.

Family 1. LARIDÆ.

2. PROCELLARIIDÆ.

3. COLYMBIDÆ.

4. ALCIDÆ.

Group 4. **Spheniscomorphæ.**

Group 5. **Alectoromorphæ.**

Group 6. **Turnicomorphæ.**

Group 7. **Pteroclomorphæ.**

Group 8. **Heteromorphæ.**

Group 9. **Peristeromorphæ.**

Suborder III. DESMOGNATHÆ.

Group 1. **Chenomorphæ.**

Family 1. **ANATIDÆ**, with *Palamedea*.

Group 2. **Amphimorphæ.**

(Genus *Phænicopterus*.)

Group 3. **Pelargomorphæ.**

Family 1. **ARDEIDÆ.**

2. **CICONIIDÆ.**

3. **TANTALIDÆ.**

Group 4. **Dysporomorphæ.**

(= *Totipalmes*, Cuv.; *Steganopodes*, Cuv.)

Group 5. **Aetomorphæ.**

(= *Raptores*, Cuv.)

Family 1. **STRIGIDÆ.**

2. **CATHARTIDÆ.**

3. **GYPAETIDÆ.**

4. **GYPOGERANIDÆ.**

Group 6. **Psittacomorphæ.**

Group 7. **Coccygomorphæ.**

Family 1. **COLIIDÆ.**

2. **MUSOPHAGIDÆ.**

3. **CUCULIDÆ.**

4. **BUCCONIDÆ.**

5. **RHAMPHASTIDÆ.**

6. **CAPITONIDÆ.**

7. **GALBULIDÆ.**

8. **ALCEDINIDÆ.**

9. **BUKEROTIDÆ.**

10. **UPUPIDÆ.**

11. **MEROPIDÆ.**

12. **MOMOTIDÆ.**

13. **CORACIIDÆ.**

14. **TROGONIDÆ.**

Intermediate Group: **Celeomorphæ** (PICIDÆ).

Suborder IV. *ÆGITHOGNATHÆ.*Group 1. *Cypselomorphæ.*

- Family 1. *TROCHILIDÆ.*
- 2. *CYPSELIDÆ.*
- 3. *CAPRIMULGIDÆ.*

Group 2. *Coracomorphæ* (= *PASSERES*).

Though agreeing with Professor Newton that Sundevall's 'Classification,' which appeared in 1872, was not quite what one would have expected from a zoologist of his great experience, at the same time workers must feel grateful to any one who helps with diagnoses of Families &c. of Birds. If Sundevall's effort cannot be compared in importance with the work of Huxley, its many suggestions, if they did not lead to any immediate adoption of the author's views, were still useful in promoting discussion and study, and therefore the 'Tentamen' acted as a stimulus for further investigation. In the 'Encyclopædia' Professor Newton has given an elaborate summary of Sundevall's results, which can there be consulted, and an English translation by Mr. F. Nicholson has recently been published.

Much was done by Professor Huxley's successors in the same field, Professor Garrod and Mr. Forbes, chiefly in the direction of the classification of the "Passeres," and the former specially directed his attention to the value of certain less-known points in the anatomy and osteology of the whole class. The work done by these young investigators was progressive, and, but for their untimely deaths, there is no doubt that their subsequent labours would have been productive of great results, and would have anticipated much of the classification which has been proposed since. As it was, the arrangement of the Class "Aves" as set forward by Garrod and Forbes was for the most part tentative, the former especially being the more sanguine about the value of his results, as those who had the privilege of listening to his addresses were wont to recognize. The certainty that the natural classification of Birds had been reached by a study of the carotid arteries or the nature of the oil-gland was upset soon after by the announcement that a more worthy character had been found in the ambiens muscle or the deep plantar tendons. The enthusiasm with which Garrod attacked his subject is fresh in the memory of all of us, and there is no difficulty in imagining what discoveries he would have made had death not claimed him as an early victim. To myself his decease was nothing less than a disaster; for he had promised his assistance in the classification of the British Museum 'Catalogue,' and only just before his death he furnished me with his characters for the Order "Passeres" as they appear in the third volume of that

work. Unfortunately, he did not give me at the time the equivalents for the succeeding groups, and he died before I could ask him for them.

Forbes possessed one advantage over Garrod, which ornithologists who knew both men were not slow to perceive. In addition to his great anatomical knowledge, he was very fond of ornithology pure and simple, and wrote not only monographic essays, such as those on *Myzomela* and *Turnix*, but he had got together a large collection of *Ploceidae* and *Cuculidae*, which he bequeathed to the British Museum, and on which he had evidently intended to found monographs of these families. He fully recognized the value of studying the life-history and habits of birds, and this doubtless led to his undertaking his successful journey to Pernambuco and his fatal one to the Niger, which ended in his death.

Garrod's scheme of classification is here added (*cf.* P. Z. S. 1874, p. 116) :—

Class **AVES.**

Subclass ***HOMALOGONATÆ.***

Order I. **GALLIFORMES.**

Cohort (a) **Struthiones.**

Family 1. **STRUTHIONIDÆ.**

Subfamily 1. *Struthioninæ.*  
2. *Rheinæ.*

Family 2. **CASUARIIDÆ.**

3. **APTERYGIDÆ.**  
4. **TINAMIDÆ.**

Cohort (β) **Gallinaceæ.**

Family 1. **PALAMEDEIDÆ.**

2. **GALLINÆ.**  
3. **RALLIDÆ.**  
4. **OTIDIDÆ.**

Subfamily 1. *Otidinæ.*

2. *Phænicopterinæ.*

Family 5. **MUSOPHAGIDÆ.**

6. **CUCULIDÆ.**

Subfamily 1. *Centropodinæ*

2. *Cuculinæ.*

Cohort (γ) **Psittaci.**

Order II. **ANSERIFORMES.**

Cohort (a) **Anseres.**

Family 1. **ANATIDÆ.**

2. **SPHENISCIDÆ.**  
3. **COLYMBIDÆ.**  
4. **PODICIPIDÆ.**

Cohort ( $\beta$ ) **Nasutæ.**

- Family 1. PROCELLARIIDÆ.
- 2. FULMARIDÆ.
- Subfamily 1. *Fulmarinæ.*
- 2. *Bulweriinæ.*

## Order III. CICONIIFORMES.

Cohort ( $\alpha$ ) **Pelargi.**

- ( $\beta$ ) **Cathartidæ.**
- ( $\gamma$ ) **Herodiones.**
- ( $\delta$ ) **Steganopodes.**

- Family 1. PHAETHONTIDÆ.
- 2. PELECANIDÆ.
- 3. PHALACROCORACIDÆ.
- 4. FREGATIDÆ.

Cohort ( $\epsilon$ ) **Accipitres.**

- Family 1. FALCONIDÆ.
- 2. STRIGIDÆ.

## Order IV. CHARADRIIFORMES.

Cohort ( $\alpha$ ) **Columbæ.**

- Family 1. COLUMBIDÆ.
- 2. PTEROCLIDÆ.

Cohort ( $\beta$ ) **Limicolæ.**

- Family 1. CHARADRIIDÆ.
- 2. GRUIDÆ.
- 3. LARIDÆ.
- 4. ALCIDÆ.

Subclass *ANOMALOGONATÆ.*

## Order I. PICIFORMES.

- Family 1. PICARÆ.
- Subfamily 1. *Picidæ.*
  - 2. *Rhamphastidæ.*
  - 3. *Capitonidæ.*
- Family 2. UPUPIDÆ.
- 3. BUCEROTIDÆ.
- 4. ALCEDINIDÆ.

## Order II. PASSERIFORMES.

- Family 1. PASSERES.
- 2. BUCCONIDÆ (?).
- 3. TROGONIDÆ.
- 4. MEROPIDÆ.
- 5. GALBULIDÆ.
- 6. CAPRIMULGIDÆ.
- 7. STEATORNITHIDÆ.
- 8. CORACIDÆ.
- Subfamily 1. *Coraciinæ.*
  - 2. *Momotinæ.*
  - 3. *Todinæ* (?).

## Order III. CYPSELIFORMES.

## Family MACROCHIRES.

Subfamily 1. *Cypselinæ.*2. *Trochilinæ.*

Forbes, only four days before his death on the Niger, wrote in his diary :—“ My final idea as to the classification of birds ” (cf. *Ibis*, 1884, p. 119):—

## Superorder ODONTORNITHES.

I. Saururæ. 1.

III. Odontoholæ. 1.

II. Odontotormæ. 1.

## Superorder RHYNCHORNITHES.

IV. Struthiones. 1.

XVI. Impennes. 1:

V. Apteryges. 1.

XVII. Tubinares. 2.

VI. Rheaæ. 1.

XVIII. Pseudogryphi. 1.

VII. Crypturi. 1.

XIX. Herodiones. 3.

VIII. Gallinæ. 3.

XX. Accipitres. 1.

IX. Opisthocomi. 1.

XXI. Steganopodes. 3.

X. Palamedæ. 1.

XXII. Pluviales. 8.

XI. Eudromades (a). 7.

XXIII. Columbæ. 2.

? Odontoglossæ.

XXIV. Todiformes. 1.

XII. Semigallinæ. 2.

XXV. Piciformes (c). 7.

XIII. Psittaci. 1.

XXVI. Coraciiformes. 2.

XIV. Lamelliostres. 1.

XXVII. Meropiformes. 8.

XV. Eretopodes (b). 3.

XXVIII. Passeres.

## (a) EUDROMADES.

Rallidæ.

## (c) PICIFORMES.

Psophiidæ.

Picidæ.

Ædienemidæ.

Capitonidæ. }

Otididæ.

Bucerotidæ.

Cariamidæ.

Upupidæ.

Serpentariidæ.

(Irrisoridæ?). }

Phœnicopteridæ.

Alcedinidæ.

Suborder *Haleyones.*

Coliidæ.

Momotidæ.

## (b) ERETOPODES.

Colymbidæ.

Podicipitidæ.

Heliornithidæ.

As the editors of ‘The Ibis’ remark, the numbers placed by Forbes after the names of the Orders evidently denote the number of families comprised in each Order.

The next Classification of importance was that of Dr. Sclater, published in ‘The Ibis’ for 1880. It depends little on original research, and is, as Sclater himself admits, mainly a revision of Prof. Huxley’s

scheme without any diagnostic characters. In any linear classification we must come to a full stop every now and again, and in reality Dr. Sclater has softened the number of "breaks" in the system as far as could be expected, and the only really serious ones occur at the end of the *Psittaci*, when the Owls are separated from *Steatornis* by the interposition of the Parrots, and the *Columbæ* have to take up the running after the *Anseres*. This memoir brings the subject of the Classification of Birds up to date, and embodies the results of all the recent work of Huxley and Parker, Garrod and Forbes, Nitzsch and Sundevall; while, as Professor Newton has very justly pointed out, there are some very valuable improvements and additions, the results of the author's own long experience.

The following is Sclater's proposed arrangement:—

Class AVES.

Subclass I. *CARINATÆ*.

Order I. PASSERES.

i. OSCINES.....	a. Turdidæ. b. Cinclidæ. c. Sylviidæ. d. Paridæ. e. Certhiidæ. f. Troglodytidæ. g. Motacillidæ. h. Mniotiltidæ. i. Hirundinidæ. j. Vireonidæ. k. Laniidæ. l. Ampelidæ. m. Cerebidæ. n. Tanagridæ. o. Fringillidæ. p. Alaudidæ. q. Icteridæ. r. Corvidæ. q. Oxyrhamphidæ. b. Tyrannidæ. c. Pipridæ. d. Cotingidæ. e. Phytotomidæ. f. Pittidæ. g. Philepittidæ. h. Eurylæmidæ. a. Dendrocopatidæ. b. Formicariidæ. c. Pteroptochidæ. a. Atrichiidæ. b. Menuridæ.
ii. OLIGOMYODÆ .....	
iii. TRACHEOPHONÆ .....	
iv. PSEUDOSCINES .....	

## Order II. PICARIAE.

Suborder 1. PICI .....	a. Piciidae.
2. CYPSELI .....	a. Trochilidae. b. Cypselidae. c. Caprimulgidae.
3. ANISODACTYLÆ .....	a. Coliidae. b. Alcedinidae. c. Bucerotidae. d. Upupidae. e. Irrisoridae. f. Meropidae. g. Momotidae. h. Todidae. i. Coraciidae. k. Leptosomidae. l. Podargidae. m. Steatornithidae.
4. HETERODACTYLÆ .....	a. Troganidae.
5. ZYGODACTYLÆ .....	a. Galbulidae. b. Bucconidae. c. Rhamphastidae. d. Capitonidae. e. Indicatoridae.
6. COCCYGES .....	a. Cuculidae. b. Musophagidae.
Order III. PSITTACI .....	a. Cacatuidae. b. Stringopidae. c. Palæornithidae. d. Psittacidæ.
IV. STRIGES .....	a. Strigidæ. b. Asionidæ.
V. ACCIPITRES .....	a. Falconidae. b. Cathartidae. c. Serpentariidae.
VI. STEGANOPODES .....	a. Fregatidae. b. Phaethontidae. c. Pelecanidae. d. Phalacrocoracidæ. e. Plotidæ.
VII. HERODIONES .....	a. Ardeidae. b. Ciconiidae. c. Plataleidae.
VIII. ODONTOGLOSSÆ .....	Phœnicopterus.
IX. PALAMEDEÆ .....	Palamedeidae.
X. ANSERES.	
XI. COLUMBÆ.	
i. COLUMBÆ .....	a. Carpophagidae. b. Columbidæ. c. Gouridæ. d. Didunculidæ.
ii. DIDI.	

Order XII. PTEROCLETES .....	Pteroclidae.
XIII. GALLINÆ.	
i. PERISTEROPODES .....	a. Cracidae. b. Megapodiidae.
ii. ALECTOROPODES .....	a. Phasianidae. b. Tetraonidae.
XIV. OPISTHOCOMI .....	Opisthocomidae.
XV. HEMIPODII .....	Hemipodiidae.
XVI. FULICARLÆ .....	a. Rallidae. b. Heliorhithidae.
XVII. ALECTORIDES .....	a. Aramidae. b. Eurypygidæ. c. Gruidæ. d. Psophiidæ. e. Cariamidae. f. Otidæ.
XVIII. LIMICOLÆ .....	a. Otidemnidæ. b. Parridae. c. Charadriidae. d. Chionocidæ. e. Thinocoridæ. f. Scolopacidae. Laridae.
XIX. GAVIÆ .....	Procellariidae.
XX. TUBINARES .....	a. Colymbidae. b. Alcidae.
XXI. PYGOPODES .....	Spheniscidæ.
XXII. IMPENNES .....	Tinamidæ.
XXIII. CRYPTURI .....	

Subclass II. *RATITÆ*.

## Order XXIV. APTERYGES.

XXV. CASUARII.

XXVI. STRUTHIONES.

In the article to which we have made such frequent allusion, Professor Newton concludes his history of Ornithology with some critical remarks on the Class Aves. He would divide the Class into three Subclasses:—

1. **SAURURÆ**, Haeckel. *Archæopteryx* the only known form.
2. **RATITÆ**, Merrem.
  - With teeth.
    - With biconcave vertebrae .....
    - With saddle-shaped vertebrae .....

As yet unknown.  
*Hesperornis*.
  - Without teeth .....

Recent and existing forms.
3. **CARINATÆ**, Merrem.
  - With teeth.
    - With biconcave vertebrae .....
    - With saddle-shaped vertebrae .....

*Ichthyornis*.  
As yet unknown.
  - Without teeth .....

Recent and existing forms.

He would divide the *Ratitæ* into six Orders :—

1. <i>ÆPYORNITHES</i> .....	Fam. <i>ÆPYORNITHIDÆ</i> .
2. <i>APTERYGES</i> .....	Fam. <i>APTERYGIDÆ</i> .
3. <i>IMMANES</i> .....	Fam. 1. <i>DINORNITHIDÆ</i> . 2. <i>PALAPTERYGIDÆ</i> .
4. <i>MEGISTANES</i> .....	Fam. 1. <i>CASUARIIDÆ</i> . 2. <i>DROMLEIDÆ</i> .
5. <i>RHEÆ</i> .....	Fam. <i>RHEIDÆ</i> .
6. <i>STRUTHIONES</i> .....	Fam. <i>STRUTHIONIDÆ</i> .

In discussing the *Carinatæ*, Professor Newton exhibits the utmost caution, and is unwilling to commit himself to a new arrangement of the Subclass, but he points out that the *Crypturi* must be considered as the first Order of the *Carinatæ*, as proposed by Professor Huxley, in whose classification they follow the *Ratitæ*. He next insists on the distinctness of the *Impennes*. He doubts the affinity of the *Podicipedidæ* with the *Pygopodes*, and he would associate the latter with the *Gaviæ* and *Limicolaæ* as one Order, the *Tubinares* being distinct and forming a separate Order by themselves.

The *Grallæ* would contain the *Fulicariæ* and *Grues*, the contents of the latter being the *Gruidæ*, *Psophiidæ*, and *Aramidæ*, along with *Eurypyga* and *Rhinochetus*.

The *Gallinæ* should rank as an Order, the *Hemipodii*, “standing somewhat apart,” the *Alectoropodes* (normal *Gallinæ*), and the *Peristeropodes* (*Megapodiidæ* and *Cracidae*) forming the three component Suborders. *Opisthocomus* is the single representative of a separate Order.

The *Pteroclidæ* are an intermediate group between the Game-Birds and Pigeons, and must either be raised to the rank of an Order, as proposed by Huxley and Gadow, or they should belong to one large group, which should contain the *Gallinæ* and *Columbæ*. The author does not fail, however, to emphasize the fact of the Dasypædine condition of nestling Sand-Grouse, a fact he has since confirmed in an interesting memoir in ‘The Ibis’ for 1890 (pp. 207–214, pl. vii.). The *Columbæ* would possess two Suborders, the Didine birds and the true Pigeons, with which latter group *Didunculus* would rank, being probably connected with the more typical *Columbidæ* by the Papuan genus *Otidiphaps*.

The *Gaviae* are closely allied to the *Limicolaæ*; and the *Grallæ*, through *Eurypyga* and *Rhinochetus*, allied to *Limicolaæ* in some respects, also trend towards the *Herodiones*. The *Gaviae* are further allied through *Phaeton* to the *Steganopodes*.

*Cariama* is an indefinite form, possessing some Accipitrine characters,

and representing possibly the remains of an ancestral type, from which the *Accipitres* and *Herodiones* have branched off at an early epoch.

The *Herodiones* contain the *Ardeæ*, *Ciconiæ*, and *Plataleæ*.

The *Phænicopteri* so much resemble the *Anseres* in certain points that they should form a Suborder of that group, equal in value to the true *Anseres* and the *Palamedeæ*.

The *Accipitres* would embrace the *Cathartidæ*, *Vulturidæ*, *Falconidæ*, and the *Serpentariidæ*, but whether *Cariama* goes here or not must remain an open question.

The *Striges* are not so nearly allied to the *Accipitres* as most people would believe, and should stand independently of that Order, to which the *Psittaci* would be perhaps the nearest allies. The *Striges* would find their closest relations in the *Picariæ*, especially with *Steatornis*, which has branched off from a common ancestor with the Owls.

The *Picariæ* represent "chaos," and until the Order has been more sufficiently studied, Professor Newton declines to meddle with it, nor would he, at the time of writing, grant to the Woodpeckers the high position of *Saurognathæ* claimed for them by Professor Parker.

The *Coccygomorphæ* he has already alluded to among the "groups allied to *Gallinæ*," where *Opisthocomus* indicates an old line of descent, now almost obliterated, in the direction of the *Musophagidæ*, and thence to the *Coccygomorphæ*, following Huxley.

Finally, in the arrangement of the *Passeres*, Professor Newton acknowledges the value of the work done by Garrod and Forbes, and adopts in the main their conclusions and those of Sclater.

The *Passeres* would therefore include three main Suborders, viz. :— the *Oligomyodi*, the *Tracheophonæ*, the abnormal *Acromyodi* or *Pseudoscines* (*Atrichiidæ* and *Menuridæ*), and finally the normal *Acromyodi* or true *Oscines*. At the head of the latter he would put the *Corvidæ* in place of the *Turdidæ*.

Such is a brief outline of Professor Newton's scheme of classification in 1884, and if he had not warned us that he considered that a phylogenetic scheme was at that time impracticable, I should have said that a highly instructive one could have been drawn up from the details which he had himself got together in the memoir from which every ornithologist can draw inspiration and ideas.

Professor Newton's article is apparently designed to bring down the history of Ornithology to the year in which it was published, but a supplement is necessary, for he makes no reference whatever to the 'Catalogue of Birds,' then in course of publication by the British Museum, although at least eight volumes had been published when he wrote in the 'Encyclopædia.' The first volume, containing a monographic revision, with descriptions and full synonymy, of the Diurnal Accipitres, was published by the Trustees in 1874. That this was considered an

important work by the late Mr. John Henry Gurney, who had devoted a lifetime to the study of the Birds of Prey, is proved by the pains with which he reviewed it in a series of essays extending over a period of seven years (*Ibis*, 1875–1882); and it will ever be a source of satisfaction to the author of this first volume of the 'Catalogue' that its publication was the cause of Mr. Gurney's review, which gave to the ornithological world the result of the years of study which the greatest authority on Accipitrine birds of our day had accumulated, and which otherwise might have died with him.

The second volume of the 'Catalogue' contained a monographic description of the *Striges*, and with the third volume was commenced the description and synonymy of the *Passeriformes*. It was the intention of the author, as already hinted (*antea*, p. 6), to have followed in the main the classification of Garrod, with the subdivisions of Wallace and Sundevall, but this system of classification soon broke down, owing to the refusal of Mr. Seeböhm, who wrote the fifth volume of the 'Catalogue,' to receive into the *Turdidae* such obvious forms as *Pratincola*, *Copsychus*, &c., which had, therefore, to be incongruously accommodated in the *Muscicapidae* and *Timeliidae*.

As for myself, I may say that the reception which has been accorded to my labours on the 'Catalogue' has been most gratifying, for my colleagues everywhere have been generous enough to recognize in the most kindly manner the work to which I have devoted the best years of my life.

The 'Catalogue of Birds' was initiated by the Keeper of the Zoological Department of the British Museum, my respected chief, Dr. Günther, and designed by him on the plan of his celebrated 'Catalogue of Fishes.' In the year 1872, when I commenced the Catalogue, the Classification of Birds was in a transitional state, as anyone who studies the history of Ornithology can discover, and in starting with the *Accipitres* I reverted to the older form of arrangement. Thus the *Accipitres* were selected for the initial volume, and the *Passeriformes* followed. That the arrangement of the latter is scientifically faulty, no one, least of all the author of the principal volumes, will deny, but for this he will contend, that it is something to correlate the synonymy of the genera and species of Birds, and to have described all the known species up to date, a task not attempted for more than sixty years. The classification of the higher groups and families will follow when more material for a definite conclusion has been obtained.

In 1882 appeared Dr. Reichenow's 'Die Vögel der Zoologischen Gärten,' with a scheme of arrangement of birds, which also seems to have escaped Professor Newton's notice. It contains a phylogenetic tree, and the location of the families displays some rather novel

ideas. As this classification has attracted considerable attention in Germany, and has been followed by some recent writers, I here reproduce Dr. Reichenow's scheme :—

Series I.

Order I. BREVIPENNES.

Fam. 1. STRUTHIONIDÆ.

Series II. NATATORES.

Order II. URINATORES.

Fam. 2. SPHENISCIDÆ.  
3. ALCIDÆ.  
4. COLYMBIDÆ.

Order III. LONGIPENNES.

Fam. 5. PROCELLARIIDÆ.  
6. LARIDÆ.  
7. STERNIDÆ.

Order IV. STEGANOPODES.

Fam. 8. GRACULIDÆ.  
9. SULIDÆ.  
10. PELECANIDÆ.

Order V. LAMELLIROSTRES.

Fam. 11. MERGIDÆ.  
12. ANATIDÆ.  
13. ANSERIDÆ.  
14. CYGNIDÆ.  
15. PALAMEDEIDÆ.

Series III. GRALLATORES.

Order VI. CURSORES.

Suborder A. **Limicolæ.**

Fam. 16. CHARADRIIDÆ.  
17. DROMADIDÆ.  
18. SCOLOPACIDÆ.

Subfam. A. *Himantopodinæ.*  
B. *Totaninæ.*  
C. *Scolopacinæ.*

Suborder B. **Arvicolæ.**

Fam. 19. OTIDIDÆ.  
20. GRUIDÆ.

Suborder C. **Calamocolæ.**Fam. 21. **RALLIDÆ.**

- Subfam. A. *Rallinæ.*
- B. *Gallinulinæ.*
- C. *Parrinæ.*

Fam. 22. **EURYPYGIDÆ.**Suborder D. **Deserticolæ.**Fam. 23. **THINOCORIDÆ.**

- 24. **TURNICIDÆ.**
- 25. **PTEROCLIDÆ.**

## Order VII. GRESSORES.

Fam. 26. **IBIDÆ.**

- 27. **CICONIDÆ.**
- 28. **PHœNICOPTERIDÆ.**
- 29. **SCOPIDÆ.**
- 30. **BALÆNICIPIDÆ.**
- 31. **ARDEIDÆ.**

## Series IV.

## Order VIII. GYRANTES.

Fam. 32. **DIDIDÆ.**

- 33. **DIDUNCULIDÆ.**
- 34. **CARPOPHAGIDÆ.**
- 35. **GEOTRYGONIDÆ.**
- 36. **COLUMBIDÆ.**

Series V. **CAPTATORES.**

## Order IX. CRYPTURI.

Fam. 37. **CRYPTURIDÆ.**

## Order X. RASORES.

Fam. 38. **MEGAPODIDÆ.**

- 39. **CRACIDÆ.**
- 40. **OPISTHOCOMIDÆ.**
- 41. **PHASIANIDÆ.**

- Subfam. A. *Pavoninæ.*
- B. *Phasianinæ.*

Fam. 42. **PERDICIDÆ.**

- Subfam. A. *Perdicinæ.*
- B. *Odontophorinæ.*

Fam. 43. **TETRAONIDÆ.**

## Order XI. RAPTATORES.

## Fam. 44. VULTURIDÆ.

- Subfam. A. *Sarcophamphinae*.
- B. *Vulturinae*.
- C. *Gypactinae*.

## Fam. 45. FALCONIDÆ.

- Subfam. A. *Polyborinae*.
- B. *Accipitrinae*.

- Section a. *Asturinae*.
- b. *Spizaetinae*.

Subfam. C. *Buteoninae*.

- Section a. *Milvinæ*.
- b. *Buteoninæ*.

Subfam. D. *Falconinae*.

## Fam. 46. STRIGIDÆ.

- Subfam. A. *Buboninae*.
- B. *Ulineæ*.
- C. *Striginae*.

## Series VI. FIBULATORES.

## Order XII. PSITTACI.

- Fam. 47. STRINGOPIDÆ.
- 48. PLISSOLOPHIDÆ.
- 49. PLATYCERCIDÆ.
- 50. MICROPSITTACIDÆ.
- 51. TRICHOGLOSSIDÆ.
- 52. PALÆORNITHIDÆ.
- 53. PSITTACIDÆ.
- 54. CONURIDÆ.
- 55. PIONIDÆ.

## Order XIII. SCANSORES.

## Fam. 56. MUSOPHAGIDÆ.

- 57. COLIIDÆ.
- 58. CROTOPHAGIDÆ.
- 59. CUCULIDÆ.

Subfam. A. *Zanclostominae*.

- Section a. *Geococcyges*.
- b. *Zanclostominae*.

Subfam. B. *Coccyzinae*.

- C. *Cuculinae*.

## Fam. 60. INDICATORIDÆ.

- 61. BUCCONIDÆ.

- 62. TROGONIDÆ.

Fam. 63. **GALBULIDÆ.**64. **RHAMPHASTIDÆ.**65. **CAPITONIDÆ.**Section *a*. American species.

b. Asiatic species.

c. African species.

Fam. 66. **PICIDÆ.**Subfam. A. *Picumninæ.*B. *Dendrocopinæ.*C. *Psilorhincæ.*D. *Picinæ.*Series VII. **ARBORICOLÆ.**

## Order XIV. INSESSORES.

Fam. 67. **BUCEROTIDÆ.**68. **ALCEDINIDÆ.**Subfam. A. *Halcyoninæ.*B. *Alcedininæ.*Fam. 69. **MEROPIDÆ.**70. **UPUPIDÆ.**71, 72. **CORACHIDÆ.**Subfam. A. *Coraciinæ.*B. *Podarginæ.*

## Order XV. STRISORES.

Fam. 73. **CAPRIMULGIDÆ.**74. **CYPSELIDÆ.**75. **TROCHILIDÆ.**Subfam. A. *Phaethornithinæ.*B. *Trochilinæ.*

## Order XVI. CLAMATORES.

Fam. 76. **AMPELIDÆ.**Subfam. A. *Phytotominæ.*B. *Ampelinæ.*C. *Lipauginæ.*Fam. 77. **TYRANNIDÆ.**78. **ANABATIDÆ.**Subfam. A. *Dendrocolaptinæ.*B. *Anabatinæ.*C. *Furnariinæ.*Fam. 79. **ERIODORIDÆ.**Subfam. A. *Hylactinæ.*B. *Eriodorinæ.*

## Order XVII. OSCINES.

## Fam. 80. HIRUNDINIDÆ.

## 81. MUSCICAPIDÆ.

Subfam. A. *Bombycillinæ.*B. *Muscicapinæ.*C. *Myiagrinæ.*

## Fam. 82. CAMPEPHAGIDÆ.

## 83. LANIIDÆ.

Subfam. A. *Laniinæ.*B. *Malacotoninæ.*

## Fam. 84. CORVIDÆ.

Subfam. A. *Gymnorhinæ.*B. *Corvinæ.*C. *Garrulinæ.*D. *Dendrocittinæ.*E. *Fregillinæ.*

## Fam. 85. PARADISEIDÆ.

Subfam. A. *Paradiseinæ.*B. *Tectonarchinæ.*C. *Glaucopinæ.*

## Fam. 86. ORIOLIDÆ.

## 87. STURNIDÆ.

## 88. ICTERIDÆ.

## 89. PLOCEIDÆ.

Subfam. A. *Ploceinæ.*B. *Spermestinæ.*

## Fam. 90. FRINGILLIDÆ.

Subfam. A. *Fringillinæ.*B. *Pyrrhulinæ.*C. *Coccoborinæ.*D. *Emberizinæ.*

## Fam. 91. SYLVICOLIDÆ.

Subfam. A. *Arremoninæ.*B. *Thraupinæ.*C. *Sylvicolinæ.*D. *Motacillinæ.*

## Fam. 92. ALAUDIDÆ.

## 93. BRACHYPODIDÆ.

## 94. MELIPHAGIDÆ.

## 95. NECTARINIDÆ.

## 96. DACNIDIDÆ.

a. New World forms (*Dacnis*, &c.).b. Old World forms (*Dicæum*, &c.).

## 97. CERTHIIDÆ.

## 98. PARIDÆ.

Fam. 99. *TIMELEIIDÆ.*

- Subfam. A. *Timeliinæ.*
- B. *Cisticolinæ.*
- C. *Troglodytinæ.*
- D. *Miminæ.*
- E. *Copsychinæ.*

Fam. 100. *SYLVIIDÆ.*

- Subfam. A. *Sylviinæ.*
- B. *Turdinæ.*
- Section a. *Turdiformes.*
- b. *Lusciniformes.*

Although there is much that is new and much that is suggestive in this classification of Reichenow's, it is founded on such totally different ideas from those generally entertained in England and America that it is difficult to institute a comparison between the systems in vogue in 1882 and that propounded by our worthy colleague in Berlin. His classification, however, is based on absolute experience, and is accompanied by illustrative descriptions.

Commencing with higher "Series," which are equal in most cases to the "Sub-Classes" of other systematists, the author is enabled to obtain high rank for his "Orders" and "Suborders," and it is particularly a feature of the classification employed by Reichenow that natural characteristics are considered of primary importance, as, for instance, when he divides his *Cursores* into "Limicolæ" (Plovers and Snipes), "Arvicolæ" (Bustards and Cranes), "Calamocolæ" (Rails and Sun-Bitterns), and "Deserticolæ" (Thinocori, Hemipodes, and Sand-Grouse). The *Crypturi* are considered to be an order of the series *Captatores*, and head the Game-birds. The family *Vulturidæ* contains three subfamilies, *Sarcorhamphinæ*, *Vulturinæ*, and *Gypaetinæ*; and Dr. Reichenow follows recent classification so far as to place the *Polyborinæ* next to the Vultures, and thence he proceeds to the *Accipitrinæ* and *Spizaetinæ*, but *Pandion* comes into his subfamily *Milvinæ*, while, after the subfamily *Buteoninæ*, his *Falconinæ* contain only *Falco* and *Hierax*.

Reichenow's classification of the *Passeres* follows mainly that of his celebrated compatriot Professor Cabanis, but the leading divisions differ. The suborders known to English naturalists as *Passeriformes* and *Picariæ* are divided by Cabanis into four orders—*Oscines*, *Clamatores*, *Strisores* (*Macrochires* and *Coccyges*, auct.), and *Scansores*, to which we may add the *Psittaci*. Reichenow somewhat modifies this classification. The *Passeriformes* and *Picariæ* he places under the heading of two great SERIES, the *Fibulatores* and the *Arboricolæ*. The *Psittaci* remain as an order, with nine families. His *Scansores* contain all the *Scansores* of Cabanis, but he places the *Crotophagidæ* as a separate family, equal in value to the *Cuculidæ*, and

from Cabanis's *Strisores* he also takes away the *Coliidæ* and *Musophagidæ*, and adds them to the *Scansores*.

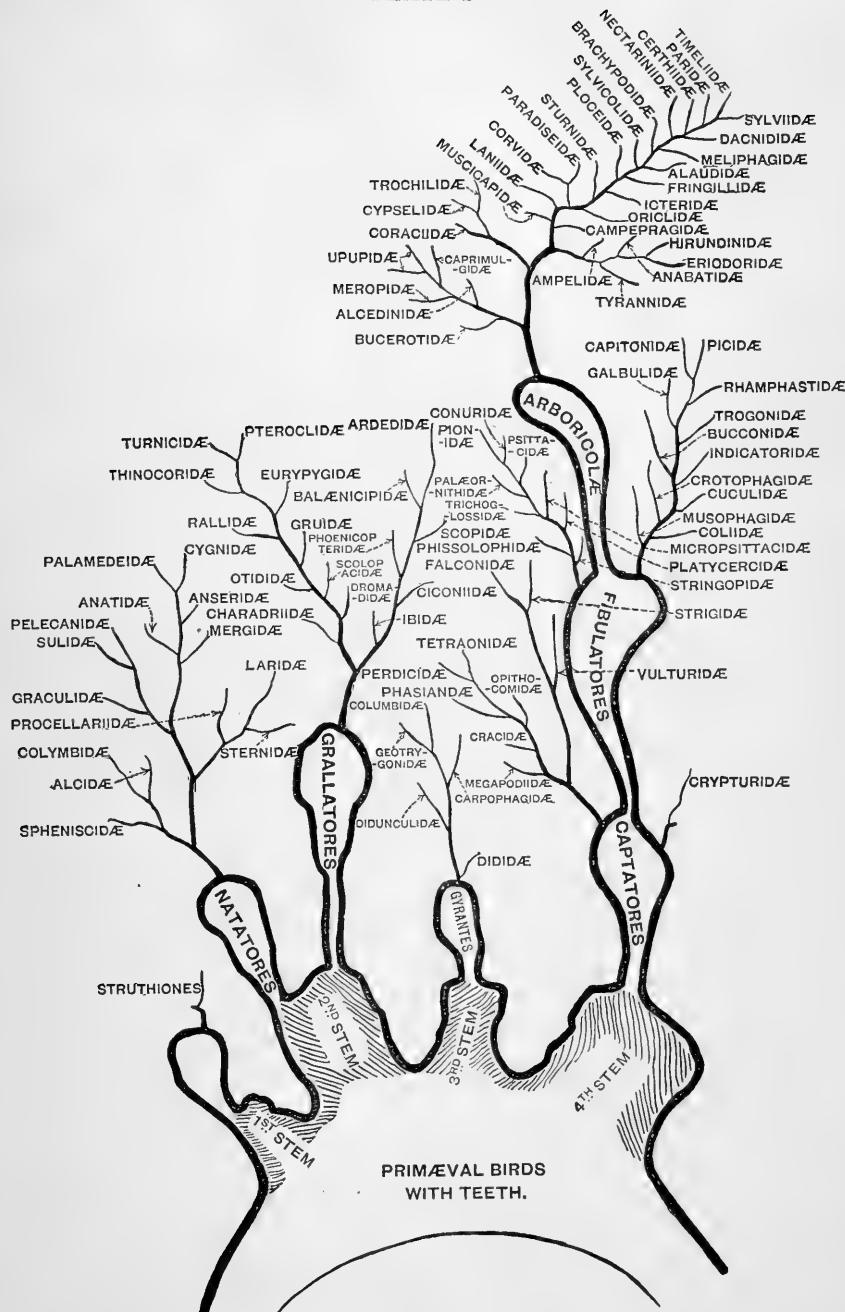
With Reichenow the *Strisores* do not disappear as an order, but, following the *Momotidæ* and *Todidæ*, are merged in the *Coraciidæ* (with which the *Eurylæmidæ* are also classified, in the neighbourhood of *Eurystomus*). The *Podarginæ* make up the second subfamily of the *Coraciidæ*; and then the *Strisores*, containing the *Caprimulgidæ*, *Cypselidæ*, and *Trochilidæ*, appear as an order between the *Insessores* (*Bucerotidæ*, *Alcedinidæ*, *Meropidæ*, *Upupidæ*, and *Coraciidæ*) and the *Clamatores*. The latter commence with the *Ampelidæ*, with the subfamilies *Phytotominae*, *Ampelinæ*, and *Lipauginæ*, and follow the order of the 'Museum Heineanum' to the *Hypocnemidæ*, which contains the Pittas and the subfamily *Myiotherinæ*. The *Oscines* are by no means the same as in the 'Museum Heineanum,' and many changes are introduced. The *Picariæ* of modern systematists form merely an order of the *Arboricolæ*, equal in value to the *Clamatores* and *Oscines*; and in this arrangement some seemingly natural families are widely separated, as, for instance, the *Paradiseidæ* from the *Corvidæ* &c., while the arrangement of the Oscinine families seems to me a little unnatural.

What will be of most interest to Ornithologists generally will be the phylogenetic tree which the author has given in his introduction. This, by the courtesy of Dr. Reichenow, I am permitted to introduce (see p. 23).

The year 1884 was signalized by the appearance of Professor Elliott Coues's revised edition of the 'Key to North-American Birds,' a work the author of which America may be proud to claim as one of her children. It is still the Ornithologist's *vade-mecum*, and the practical portion of it, which forms the best introduction now extant to the study of birds, has recently been re-issued as a separate work by Messrs. Macmillan, so that it is now within the reach of every student. As the special portion of the work deals principally with American birds, and as many great families are unrepresented in the Nearctic Region, the efforts of the author have been chiefly directed towards the elucidation of the Avifauna of North America. The "Keys" also are avowedly artificial; but the many hints given throughout the book, and the author's intimate acquaintance with his subject, render it a most important text-book for the student of the classification of birds. The next great American text-book, the 'Standard Natural History,' owes much to the influence of Professor Coues's teaching.

This 'Standard Natural History' (Boston: Cassino and Co.) was issued in 1885. It was edited by Mr. John Sterling Kingsley, and the volume devoted to the Birds was apparently intrusted to the care of Dr. L. Stejneger, a Scandinavian naturalist who has settled in America. The diligence which he has shown in unearthing the work of forgotten

## PLATE I.



PHYLOGENETIC TREE OF THE CLASS "AVES."

From Reichenow's 'Vögel der Zoologischen Gärten,' 1882. (By permission of Dr. Reichenow.)

authors, and the acumen with which he has ferreted out questions of priority of nomenclature, have resulted in the most wholesale change of names in Ornithology; and as these determinations have been largely accepted in America, but not yet in Europe, there has arisen a wide divergence in nomenclatural usage between the Ornithologists of the Old World and those of the New, which finds accentuation in the Lists of Birds published by the British and American Ornithologists' Unions respectively. Luckily for myself, the present Address does not concern itself with nomenclature, and I only mention the subject out of respect to the name of Dr. Stejneger, who is responsible for most of the recent discoveries which have led to such drastic changes; so that it is not surprising to find that, in the scheme of classification which he sets forward in the 'Standard Natural History,' a number of perfectly new and, as it seems to me, unnecessary names have been showered upon the ornithological world, already sufficiently burdened with the task of remembering names.

The following is Dr. Stejneger's scheme in detail; and I must emphatically state my conviction that, with the exception of some of Professor Elliott Coues's essays, there has never been a popular work on birds so well conceived as the "Aves" volume of the 'Standard Natural History,' or one which, professedly popular in its aims, contains such an amount of sterling new and original work. It differs, moreover, from most recent schemes in giving diagnostic characters for every Order and Family, and is thus entitled to the foremost rank as an original work.

Subclass I. **SAURURÆ.**

Order I. ORNITHOPAPPI.

(*Archæopteryx, Laopteryx?*)

Subclass II. **ODONTOTORMÆ.**

Order I. PTEROPAPPI.

(*Ichthyornis, Apatornis*).

Subclass III. **ODONTOHOLCÆ.**

Order I. DROMÆOPAPPI.

(*Hesperornis, &c.*)

Subclass IV. **EURHIPIDURÆ.**

Super-Order I. **DROMÆOGNATHÆ.**

Order I. STRUTHIONES.

Super-family I. **Struthioideæ.**

Super-family II. **Rheoideæ.**

Super-family III. **Casuaroideæ.**

Family 1. **DROMAIIDÆ.**

2. **CASUARIIDÆ.**

Super-family IV. **Dinornithoideæ.**

Order II. *ÆPYORNITHES.*

Order III. *APTERYGES.*

Order IV. *CRYPTURI.*

(Order *GASTORNITHES.*)

Super-Order II. *IMPENNES.*

Order V. *PTILOPTERI.*

Family *SPHENISCIDÆ.*

Super-Order III. *EUORNITHES.*

Order VI. *CECOMORPHÆ.*

Super-family I. *Colymboidæ.*

Family 1. *COLYMBIDÆ.*

(*PODICIPEDIDÆ, auct.*)

Super-family II. *Heliornithoidæ.*

(*Helornis.*)

Super-family III. *Alcoideæ.*

Family 1. *URINATORIDÆ.*

2. *ALCIDÆ.*

Super-family IV. *Laroideæ.*

Family 1. *STERCORARIIDÆ.*

2. *LARIDÆ.*

Super-family V. *Procellaroideæ.*

Family 1. *DIOMEDIDÆ.*

2. *PROCELLARIIDÆ.*

3. *PELECANOIDIDÆ.*

Order VII. *GRALLÆ.*

Super-family VI. *Chionoideæ.*

Family 1. *CHIONIDÆ.*

2. *THINOCORIDÆ.*

Super-family VII. *Scolopacoideæ.*

Family 1. *GLAREOLIDÆ.*

2. *DROMADIDÆ.*

3. *CHARADRIIDÆ.*

4. *JACANIDÆ.*

5. *SCOLOPACIDÆ.*

6. *ŒDICNEMIDÆ.*

7. *OTIDIDÆ.*

Super-family VIII. *Eurypygoideæ.*

Family 1. *EURYPYGIDÆ.*

2. *RHINOCHETIDÆ.*

3. *MESITIDÆ.*

Super-family IX. **Cariamoideæ.**

Super-family X. **Gruicoidæ.**

Family 1. **PSOPHIIDÆ.**

2. **GRUIDÆ.**

3. **ARAMIDÆ.**

4. **RALLIDÆ.**

Order VIII. CHENOMORPHÆ.

Super-family XI. **Anhimoideæ.**

Super-family XII. **Anatoideæ.**

Family 1. **CNEMIORNITHIDÆ.**

2. **CEREOPSIDÆ.**

3. **ANSERANATIDÆ.**

4. **PLECTROPTERIDÆ.**

5. **ANATIDÆ.**

Super-family XIII. **Phœnicopteroideæ.**

Family 1. **PALÆOLODONTIDÆ.**

2. **PHœNICOPTERIDÆ.**

Order IX. HERODII.

Super-family XIV. **Ibidoideæ.**

Super-family XV. **Ardeoideæ.**

Family 1. **CICONIIDÆ.**

2. **SCOPIDÆ.**

3. **BALÆNINCIPITIDÆ.**

4. **ARDEIDÆ.**

Order X. STEGANOPODES.

Super-family XVI. **Pelecanoideæ.**

Family 1. **PELECANIDÆ.**

2. **SULIDÆ.**

3. **PHALACROCORACIDÆ.**

4. **ANHINGIDÆ.**

Super-family XVII. **Fregatoideæ.**

Super-family XVIII. **Phaetontoideæ.**

Order XI. OPISTHOCOMI.

Order XII. GALLINÆ.

Suborder i. **GALLINÆ ALECTOROPODES.**

Family 1. **TETRAONIDÆ.**

2. **PHASIANIDÆ.**

Suborder ii. **GALLINÆ PERISTEROPODES.**

Family 1. **MEGAPODIIDÆ.**

2. **CRACIDÆ.**

## Order XIII. PTEROCLETES.

## Order XIV. COLUMBÆ.

## Family 1. DIDIDÆ.

2. DIDUNCULIDÆ.

3. GOURIDÆ.

4. COLUMBIDÆ.

5. CARPOPHAGIDÆ.

## Order XV. ACCIPITRES.

## Family 1. GYPOGERANIDÆ.

2. CATHARTIDÆ.

3. FALCONIDÆ.

Subfamily 1. *Vulturinæ*.2. *Aquilinæ*.3. *Pandioninæ*.4. *Circinæ*.5. *Milvinæ*.6. *Polyborinæ*.7. *Accipitrinæ*.8. *Falconinæ*.

## Family 4. STRIGIDÆ.

Subfamily 1. *Asioninæ*.2. *Striginæ*.

## Order XVI. PSITTACI.

## Family 1. STRINGOPIDÆ.

2. PLICTOLOPHIDÆ.

3. PLATYERCIDÆ

4. PALÆORNITHIDÆ.

5. PSITTACIDÆ.

6. CONURIDÆ.

## Order XVII. PICARLÆ.

Super-family I. **Cuculoideæ**.

## Family 1. MUSOPHAGIDÆ.

2. CUCULIDÆ.

Super-family II. **Coracoideæ**.

## Family 1. STEATORNITHIDÆ.

2. PODARGIDÆ.

3. CAPRIMULGIDÆ.

4. CORACIDÆ.

5. LEPTOSOMATIDÆ.

Super-family III. **Colioideæ**.Superfamily IV. **Alcedinoideæ**.

## Family 1. MEROPIDÆ.

2. TODIDÆ.

Family 3. **MOMOTIDÆ.**

4. **ALCEDINIDÆ.**
5. **BUKEROTIDÆ.**

Super-family V. **Upupoideæ.**

- Family 1. **UPUPIDÆ.**
2. **IRRISORIDÆ.**

Super-family VI. **Picoideæ.**

- Family 1. **BUCCONIDÆ.**
2. **GALBULIDÆ.**
3. **RHAMPHASTIDÆ.**
4. **MEGALÆMIDÆ.**
5. **INDICATORIDÆ.**
6. **PICIDÆ.**

- Subfamily 1. *Picumninæ.*
2. *Picinæ.*
3. *Lynginæ.*

Super-family VII. **Trogonoideæ.**Super-family VIII. **Micropoideæ.**

- Family 1. **CYPSELIDÆ.**
- Subfamily 1. *Chæturinæ.*
2. *Micropodinæ.*

- Family 2. **TROCHILIDÆ.**

## Order XVIII. PASSERES.

Super-family I. **Menuroideæ.**

- Family 1. **MENURIDÆ.**
2. **ATRICHORNITHIDÆ.**

Super-family II. **Eurylaimoideæ.**Super-family III. **Tyrannoideæ.**

- Family 1. **XENISCIDÆ.**
2. **PHILEPITTIDÆ.**
3. **PITTIDÆ.**
4. **TYRANNIDÆ.**
5. **PIPRIDÆ.**
6. **COTINGIDÆ.**
7. **PHYTOTOMIDÆ.**

Super-family IV. **Formicaroideæ.**

- Family 1. **CONOPOPHAGIDÆ.**
2. **PTEROPTOCHIDÆ.**
3. **FORMICARIDÆ.**
4. **DENDROCOLAPTIIDÆ.**
5. **FURNARIIDÆ.**

Super-family V. **Passeroideæ.**

Family 1. **ALAUDIDÆ.**  
 2. **MOTACILLIDÆ.**  
 3. **ENICURIDÆ.**  
 4. **TIMALIIDÆ.**  
 5. **LIOTRICHIDÆ.**  
 6. **MUSCICAPIDÆ.**  
 7. **TURDIDÆ.**  
 8. **CINCLIDÆ.**  
 9. **TROGLODYTIDÆ.**  
 10. **CHAMÆIDÆ.**  
 11. **MIMIDÆ.**  
 12. **HIRUNDINIDÆ.**  
 13. **CAMPÉPHAGIDÆ.**  
 14. **DICRURIDÆ.**  
 15. **AMPELIDÆ.**  
 16. **ARTAMIDÆ.**  
 17. **LANIIDÆ.**  
 18. **VIREONIDÆ.**  
 19. **PARIDÆ.**  
 20. **ORIOLIDÆ.**  
 21. **PARADISEIDÆ.**  
 22. **CORVIDÆ.**  
 23. **STURNIDÆ.**  
 24. **MELIPHAGIDÆ.**  
 25. **NECTARINIIDÆ.**  
 26. **DICÆIDÆ.**  
 27. **CERTHIIDÆ.**  
 28. **CÆREBIDÆ.**  
 29. **MNIOTILTIDÆ.**  
 30. **TANAGRIDÆ.**  
 31. **PLOCEIDÆ.**  
 32. **ICTERIDÆ.**  
 33. **FRINGILLIDÆ.**

Although Dr. Stejneger secured the co-operation of such competent naturalists as Mr. D. G. Elliot, Mr. W. B. Barrows, and Mr. J. S. Kingsley to describe some of the orders in the 'Standard Natural History,' there is no doubt that the original work in the volume is almost entirely his own, and he shows a wide insight into the details of the subject. Not only does he incorporate all the best recent work of contemporary authors, but he leaves plenty of food for reflection to the systematist, and no one can doubt that his conclusions have had considerable weight with many writers who have succeeded him.

Compared with Dr. Sclater's arrangement, which was the immediate predecessor of Dr. Stejneger's, there are considerable differences to be found in the one proposed by the latter author. Of the Passerine series I shall have to speak presently. The *Oligomyodæ* and *Tracheophonæ* of the former scheme are split up by Stejneger into three super-families, each of which is equivalent in value to the Oscines

(=Passeroideæ of Stejneger). In the treatment of the *Picariæ* there is considerable discrepancy, and here it seems that some of Stejneger's most enduring work will be found. Both he and Sclater are agreed about the *Coccyges* (=Cuculoideæ of Stejneger), and Sclater's "*Zygodactylæ*" are nearly equal to Stejneger's *Picoideæ*, excepting that the Woodpeckers are considered by Stejneger to be merely a family of the latter, whereas Sclater places them as a suborder *Pici*, equivalent to *Cypseli*, &c. Again, the "*Heterodactylæ*" of Sclater = *Trogonoidæ* of Stejneger. The *Micropoideæ* of the latter are not equal to Sclater's *Cypseli*, as the latter contain, besides the *Cypselidæ* and the *Trochilidæ*, the family *Caprimulgidæ*, which, according to Stejneger, should come with the *Coraciidæ*, &c., in his super-family *Coracoideæ*. Thus Sclater's larger suborder "*Anisodactylæ*" is represented by three super-families in Stejneger's scheme.

In both arrangements the *Psittaci* and the *Accipitres* follow the *Picariæ*; but then comes divergence, for whereas Sclater follows with the *Steganopodes* to the *Herodiones* and *Anseres*, after the Huxleyan method, Stejneger interposes the *Columbæ* and *Gallinæ*, as well as the *Opisthoconi*, before he reaches the *Steganopodes*.

The disadvantage of dividing the authorship of a systematic work on birds, which leaves the principal author at the mercy of colleagues who may hold totally different opinions from his own, is shown in this book, where, either by Mr. Elliot or Dr. Stejneger, the *Hemipodii* are totally omitted. There is a figure of *Turnix sylvatica*, but the Hemipodes are otherwise not mentioned; so I cannot tell where Stejneger would have placed this debatable family. It is not worth while to follow our two systematists as to the value which they respectively assign to the *Eury-pygidæ*, *Cariamidæ*, and others, as to whether they are Ralline or Gruine; but it should be pointed out that, whereas Sclater places the *Heliorhithidæ* as a family of Rails, Stejneger considers them of the value of a super-family (*Heliorhithoideæ*), and puts them between his *Colymboidæ* and *Alcoideæ*.

The year 1888 may truly be said to be an "epoch-making" one in the history of Ornithology, for the wonderful book which Professor Max Fürbringer published three years ago, under the title 'Untersuchungen zur Morphologie und Systematik der Vögel,' contains such an amount of information that it would take a separate essay to summarize it, even if the present speaker had the knowledge requisite for the task, which he has not; but, luckily for our purpose, Prof. Fürbringer has published a 'Versuch eines genealogischen Vogelsystemes' at the end of his great work, by which we are able to comprehend his conclusions; and his arrangement of the Orders of Birds, allowing as it does for the intercalation of the main groups of fossil forms, enables

Ornithologists to acquire a far more complete view of evolutionary classification than was previously at their disposal, and the interest is heightened by the 'Stammbäume,' in which he endeavours to trace the apparent development of the Class "Aves" from its primitive ancestors. It will be many years before anything so elaborate as Prof. Fürbringer's work meets the eye of the student of Ornithology, and for the better comprehension of his conclusions Prof. Hans Gadow has given a very timely *résumé* in 'Nature' (vol. xxxix. pp. 150-152, 177-181).

It seems to me, looking at Prof. Fürbringer's 'Stammbäume,' that he fairly fulfils our notion of what may have been the gradual evolution of the Class "Aves" from its parent stem or stems in the distant past. The little assistance afforded by the geological record points to the conclusion that the most ancient forms differed no more radically (if we except the possession of teeth) from existing birds than many of the latter do from each other at the present day, whilst the loss of the intervening links must have been enormous.

First let us take the aberrant and outlying forms which caused Fürbringer to rank them as Intermediate Suborders or Gentes. There comes first in order his Suborder Palamedeiformes. Dr. Gadow paraphrases the author's ideas as follows:—"They show many connecting-points with the Anseres, Steganopodes, and Pelargo-Herodii; but their reception into the Pelargornithes is rendered impossible by various fundamental and primitive peculiarities. Through their intestines and pterylosis they somewhat resemble *Rhea*. Whether we place them nearer to the Anseres than to the Pelargi depends upon the taxonomic value which we happen to attribute to their skeletal, muscular, intestinal, or external features."

Mr. Seebohm (*vide infra*) places the Palamedeæ with the Lamellirostres, but the lack of uncinate processes to the ribs shows that they are a very aberrant group.

Another assemblage of birds which troubled Fürbringer was the Petrels, which he puts as an Intermediate Suborder Procellariiformes. "They are certainly a very old and isolated group" (cf. Gadow, *l. c.*). With Seebohm they form a Suborder of his Galliformes.

Fürbringer also made an "Intermediate Suborder" of the Penguins. Once more I quote Gadow's most useful summary:—

"The Penguins are a very old family, because the genus *Palæudyptes* shows that they had become specialized into diving and swimming birds, with total loss of the power of flight, in the Eocene period, or probably even earlier. Fürbringer calls the Penguins Trit-Aptenornithes, indicating that they, like the Great Auk, the Dodo, *Ocydromus*, and others, have lost their power of flight later than the Ratite. A sharp line between Deutero- and Trit-Aptenornithes cannot, however, be drawn, since *Cnemiornis*, *Gastornis*, &c., are intermediate forms, just as *Stringops* is now on the way to be Aptenornithic. Many of the characters of the Penguins, generally considered as primitive, are partly 'pseudo-primitive,' *i. e.* phylogenetically reduced and

Classis AVES.

I. Sub-Classis SAURURÆ.

Order.	Suborder.	Gens.	Family.
ARCHORNITHES .....	ARCHOPTERYGIFORMES ..	Archaeopteryges ..	Archaeopterygidae.

II. Sub-Classis ORNITHURÆ.

STRUTHIORNITHES .....	STRUTHIONIFORMES .....	Struthiones .....	Struthionidae.
RHEORNITHES .....	RHEIFORMES .....	Rheæ .....	Rheidae.
HIPPALECTRYORNITHES ..	CASUARIFORMES .....	Casuari .....	(Dromiceiidae + Casuariidae + Dromornithidae.)
Intermediate Suborder:—			
Aepyornithiformes .....	Aepyornithes .....	Aepyornithidae.	
Intermediate Suborder:—			
PALAMEDIFORMES .....	Palamedæ .....	Palamedidae.	
ANSERIFORMES .....	Gastornithes .....	Gastornithidae.	
	Answers or Lamellirostres ..	Anatidae.	
	Enaliornithes .....	Enaliornithidae.	
PODICIPITIFORMES .....	Hesperornithes .....	Hesperornithidae.	
	Colymbo-Podicipites .....	Colymbidae.	
		Podicipidae.	

PELARGORNITHES .....	CICONIIFORMES .....	Phœnicopteri .....	Palæolodidæ.	Phenicopteridæ.
Pelargo-Herodii .....		Accipitres .....	Platælidæ or Hemiglottidæ.	Ciconiidae or Pelargi.
CICONIIFORMES .....		Scopidae.	Ardeidæ or Herodii.	Balaenicipitidæ.
Steganopodes .....		Accipitres .....	Gypogeranidæ.	Cathartidæ.
Accipitres .....		(Hemeroliarpages, Pelargohar- pages.)	Gypo-Falconidæ.	Phaetontidæ.
Procellariiformes .....		Steganopodes .....	Phalacrocoracidæ.	Pelecanidæ.
Procellariiformes .....		Procellariæ or Tubinares ..	Procellariidæ.	Fregatidæ.
Intermediate Suborder:—		Aptenodytiformes .....	Aptenodytes or Impennes ..	Aptenodytidæ.
Intermediate Suborder:—		Ichthyornithiformes .....	Ichthyornithes .....	Ichthyornithidæ.
Intermediate Suborder:—		Laro-Limicolaæ .....	Charadrii .....	Apatornithidæ.
Charadriiformes .....		Charadriiformes .....	Charadriidæ.	Glareolidæ.
(Regiaornithes.)		Parræ .....	Dromadidæ.	Chionidæ.
Charadriiformes .....		Oides .....	Laridæ.	Alcidæ.
Charadriiformes .....		Parræ .....	Thinocoridæ.	Paridæ.
Charadriiformes .....		Oides .....	Odiidæ.	Gediennidæ.

*Firbringer's Classification* (continued).

### Classis AVES (*continued*).

## II. Sub-Class ORNITHURÆ (*continued*).

Order.	Suborder.	Gens.	Family.
	Intermediate Suborder:— (IRUTIFORMES)	<b>Eurypygæ</b> . . . . . <b>Grues</b> . . . . .	Eurypygidæ. Rhinocerotidæ. Aptornithidæ. Gruidæ. Psophiidae. Cariamidæ.
	Intermediate Suborder:— RALLIFORMES	<b>Fulicariæ</b> . . . . . <b>Hemipodij</b> . . . . .	Ileionithidæ. Rallidæ. Mesitidæ. Hemipodiidæ.
	ALECTORORNITHES (CHAMBOURNTHES.)	<b>Apteryges</b> . . . . . <b>Crypturi</b> . . . . . <b>Galidæ</b> . . . . . <b>Opisthoconiæ.</b>	Apterygide. Dinornithidæ. Crypturidæ. Megapodiidæ. Cracidae. Gallidæ or Alectoropodes.
	Intermediate Suborder:— COLUMBIFORMES	<b>Pterocletes</b> . . . . . <b>Columbæ</b> . . . . .	Pteroclidae. Dididae. Columbidae.
	Intermediate Suborder:— PSITTACIFORMES		Psittaciæ.

COCCYGIFORMES .....	Coccyges .....	Musophagidae.
	Intermediate Gens:—	
Galbulæ .....		
	Bucconidae.	
	Galbulidae.	
PICO-PASSERIFORMES .....		
Pico-Passeres . . . . .	Pici .....	Capitonidae.
	Passeres .....	Rhamphastidae.
Makrochires .....	Indicatoridae.	Indicatoridae.
	Picidae.	Picidae.
	Pseudoscines.	Pseudoscines.
Colii .....	Passerida or Passeres.	Passeridae.
	Cypselidae.	Cypselidae.
	Trochilidae.	Trochilidae.
CORACORNITHES .....	Coliidæ.	Coliidæ.
	Intermediate Gens:—	
	Trogonæ .....	Trogonidae.
HALCYONIFORMES .....	Halyzones .....	Halyzonidae.
	Bucerotæ .....	Alcedinidae.
	Meropæ .....	Upupidae.
CORACIFORMES .....	Bucerotidae.	Bucerotidae.
	Meropidae.	Meropidae.
	Todi .....	Monotidae.
CORACIFORMES .....	Iodidae.	Iodidae.
	Coraciæ .....	Coraciidae.
	Caprimulgæ .....	Leptosomidae.
CORACIFORMES .....	Caprimulgidae.	Caprimulgidae.
	Steatornithidae.	Steatornithidae.
CORACIFORMES .....	Podargidae.	Podargidae.
	Strigidae.	Strigidae.

ontogenetically retarded; *e. g.* the structure and distribution of the feathers, the fin-like anterior extremities, the broad scapula, and, according to Fürbringer, even the metatarsus. The resemblances with *Podiceps* and *Colymbus* are superficial only, but he cannot tell to which of recent birds the Penguins approach nearest. All that the author contends against is the removal of the Penguins into a Subclass, equivalent to the rest of the Carinatæ. On his plate 29 *a* they are represented as a lonely group."

Mr. Seebohm, in 1890, places them in his Galliformes, with "at least five characters, each of which is diagnostic." He says that they "represent," in the Antarctic Ocean, the Puffins and the Auks which abound in the Arctic Ocean, and "it is difficult to believe that they are not distantly related. The bones of the palate are so very similar in the Impennes, the Pygopodes, and the Alcidæ, that it is difficult to regard the Penguins as far removed from the Gallo-Grallæ."

The next "Intermediate Suborders" which exercise Prof. Fürbringer are the Gruiformes and the Ralliformes. "The Gruiformes," paraphrases Dr. Gadow, "are connected with the Charadriiformes by *Eurypyga*, with the Ralliformes by *Aramus*. They seem to have reached their culminating period in the Miocene age. *Dicholophus* is the most highly specialized form, and has assumed peculiar raptorial characters isomorphic with those of *Gypogeranus*, which is a true Bird of Prey."

"The Ralliformes flourished as early as the Eocene period. The Fulicariæ, consisting of the Rallidæ and *Heliornis*, are more nearly related to the Hemipodii and the Crypturi. The Suborder of the Ralliformes takes therefore a position intermediate between Gruiformes, Crypturiformes, and Apterygiformes. The latter two Suborders, together with the Galliformes, constitute the Order Alectorornithes. The relationship of the Crypturi with the Apteryges is real, and bridges over the gulf between Carinate and Ratite birds, especially through cranial and pelvic structures."

Mr. Seebohm (*vide infrà*) keeps the Apteryges in his Struthioniformes, and his Grallæ\*, which are almost co-extensive with the Gruiformes of Fürbringer, he puts between his Suborder Limicola and the Suborder Fulicarii, the latter leading on towards the Pygopodes. According to Seebohm, the Pteroclidæ and Turnicidæ are Gralline, while Fürbringer places the latter with his Ralliformes and the former with his Columbiformes.

This is Prof. Fürbringer's opinion of the Columbiformes, according to Dr. Gadow:—"They stand between Charadriiformes and Peristeropodes, perhaps nearer the former through the Pterocletes, which are undoubtedly the more primitive group, whilst the Columbæ, beginning with the Miocene age, are still on the ascending scale, and are birds of the

\* "The Rails and their allies really belong to the same group as the Cranes and their allies, but for convenience they may be allowed to form a separate section characterized by their holorhinal nasals" (Classif. B. p. 40).

future. *Didus* and *Pezophaps* are degenerate Columbæ, not necessarily very old forms." Mr. Seeböhm (*vide infrà*) places his Columbæ in his Subclass Passeriformes, and this he does in both his "Schemes."

Lastly we have the Psittaciformes of Prof. Fürbringer, an Intermediate Suborder placed by him between the Alectorornithes (like the Columbiformes) and Coracornithes. Mr. Seeböhm makes them an Order of his Falconiformes.

Prof. Fürbringer has given an arrangement of his Orders, which I have put into the form of a map (p. 38) for the sake of comparison with Mr. Seeböhm's arrangement, for which I have also prepared a map (*vide infrà*, p. 48).

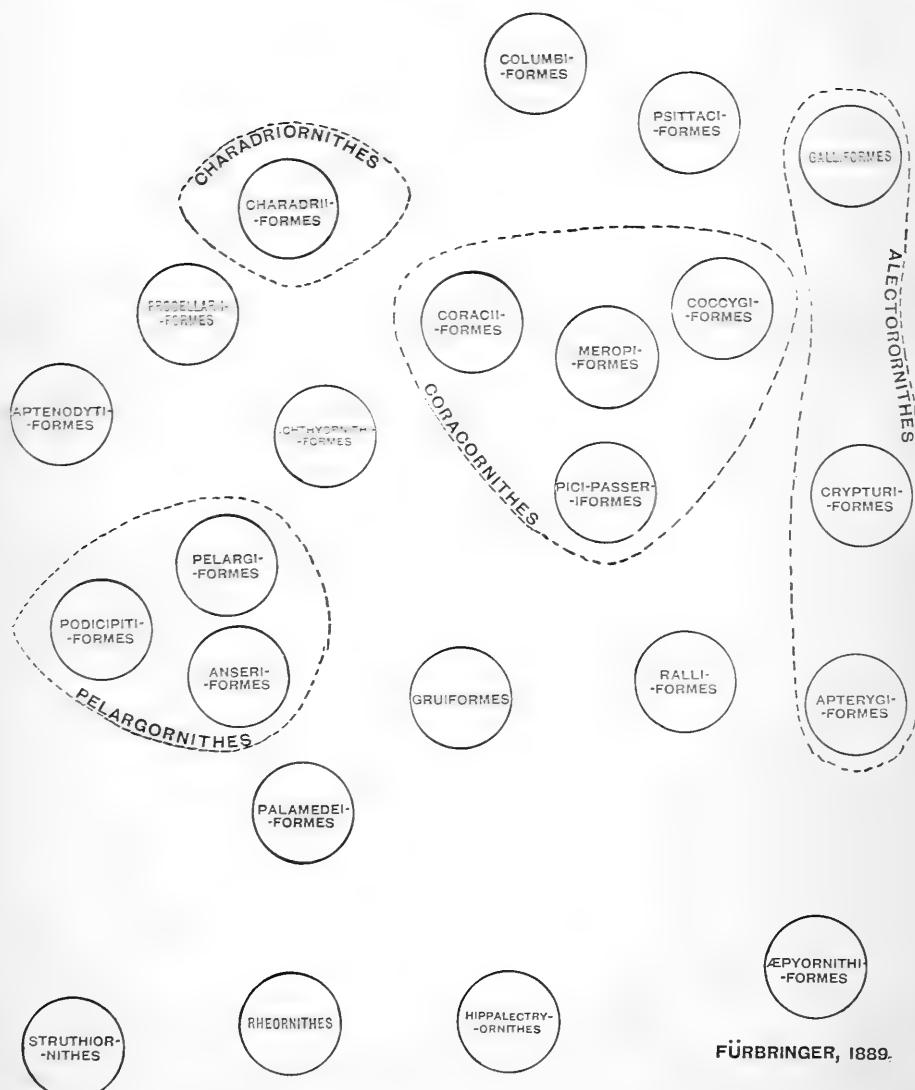
The model on the table will give the best idea of the phylogenetic scheme which Professor Fürbringer has constructed for the elucidation of the probable evolution of Birds. By his kind permission I am also able to reproduce here (Plates III., IV.) reduced figures of the "Stammäume" in his celebrated work, from which the model has been taken. He strikes three horizontal sections through his "tree," and the diagrams of these he has also given me leave to reproduce (Plates V., VI., VII.). In the first section (Plate V.) we find that the Archornithes (represented by *Archæopteryx*) have not survived, but that the Struthiornithes, Rheornithes, Hippalectryornithes, and probably also the Æpyornithes have branched off from the main body of the tree. The stems of the Alectorornithes (with the Apterygidæ, Dinornithidæ, Crypturiformes, Galliformes, and Ralliformes), Charadriornithes, and Pelargornithes are already flourishing, and independent branches show that the Palamedeiformes, Aptenodytiformes, Procellariiformes, Ichthyornithiformes, Gruiformes, Columbiformes, and Psittaciformes have developed for themselves a separate growth. The Coracornithes are only commencing to be evolved.

The second or middle section of the tree (Plate VI.) shows us that several forms have not persisted. Dead branches indicate the Enaliornithes, Dinornithidæ, and the Ichthyornithiformes, but all the other branches have developed new twigs, many of great size. Thus the Galliformes have developed four "family" branchlets, and the Gallidæ alone have four large twigs; and so on with all the larger groups.

The third or topmost section (Plate VII.) shows the development of the Coracornithes, with the Striges as a large outlying group of the Coraciiformes. I do not proceed further with the subject of Professor Fürbringer's pedigree of the Class "Aves," as, by means of his courtesy, the readers of this Address will be able to study for themselves the maps which he has drawn up for the explanation of his views. They can of course be still better studied in the Professor's larger work \*, but I must tender him my sincere thanks for allowing me to place the accompanying illustrations before my readers.

\* 'Bijdragen tot de Dierkunde,' Amsterdam, Afl. xv. (1888).

## PLATE II.



AN ATTEMPTED ARRANGEMENT OF FÜRBRINGER'S SCHEME in the form of a Map, taken from p. 1568 of the 'Bijdragen,' for comparison with those of Seebold (p. 48) and my own (Plate IX.). [N.B.—Prof. Fürbringer is not responsible for this arrangement in circles, and it is to be noticed that the Psittaciformes should have been placed nearer to the *Coracornithes*, and the Columbiformes nearer to the *Alectornithes*.]

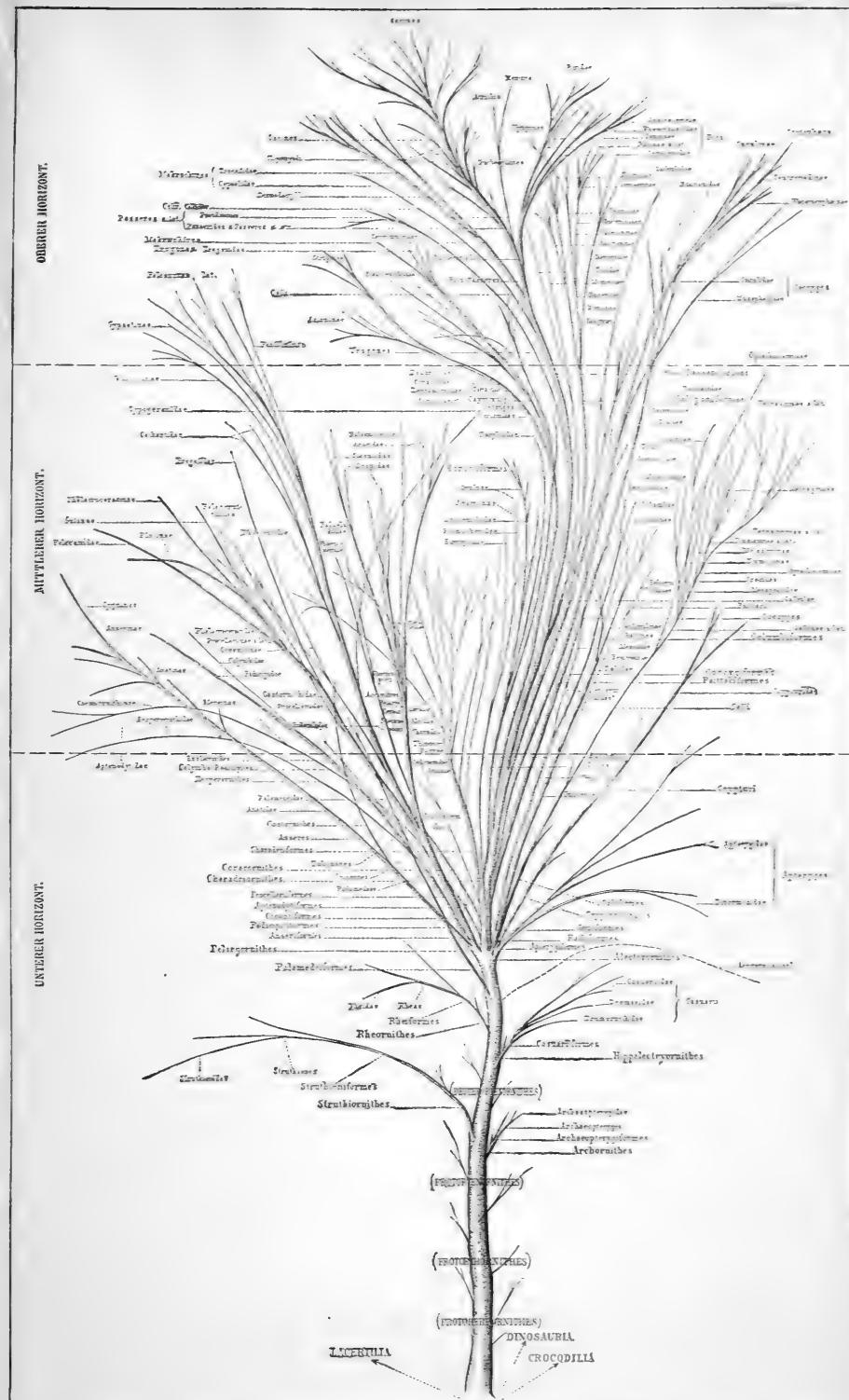


PLATE III.—VERTICAL ASPECT OF FÜRBRINGER'S PHYLOGENETIC TREE OF BIRDS  
 from the side of the Struthiornithes, Rheornithes, Pelargornithes, Hippalctry-  
 ornithes, Gruiformes, and Ralliformes. [Copied, by the Author's permission, from  
 his memoir entitled "Untersuchungen zur Morphologie und Systematik der  
 Vögel," published in the 'Bijdragen tot de Dierkunde,' Amsterdam, vol. xv. Taf.  
 xxvii. (1888).]

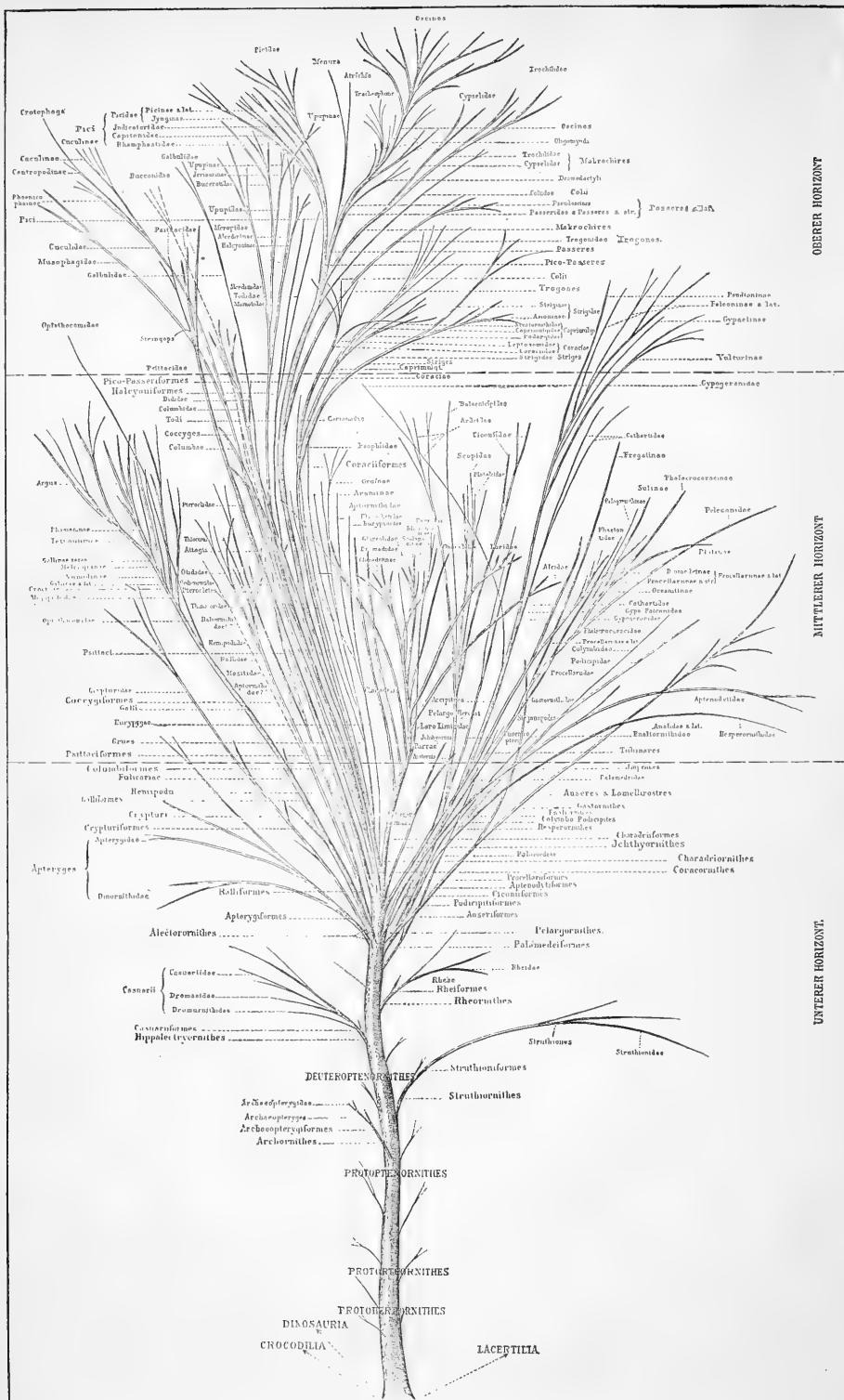
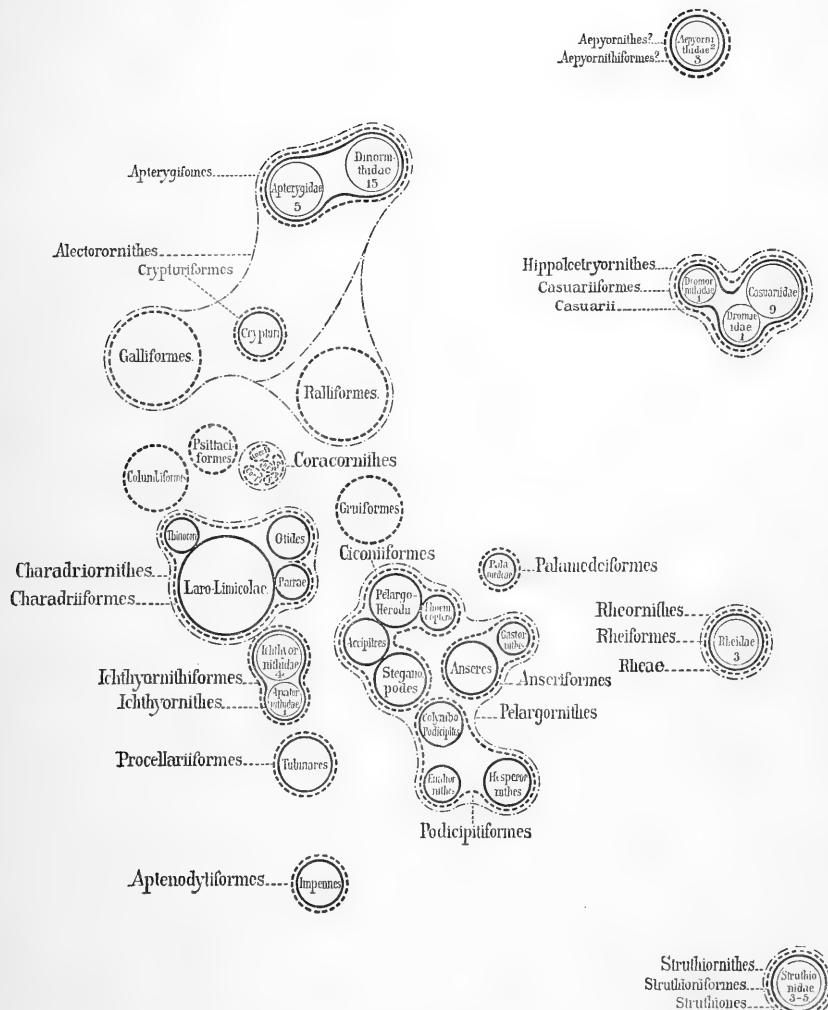


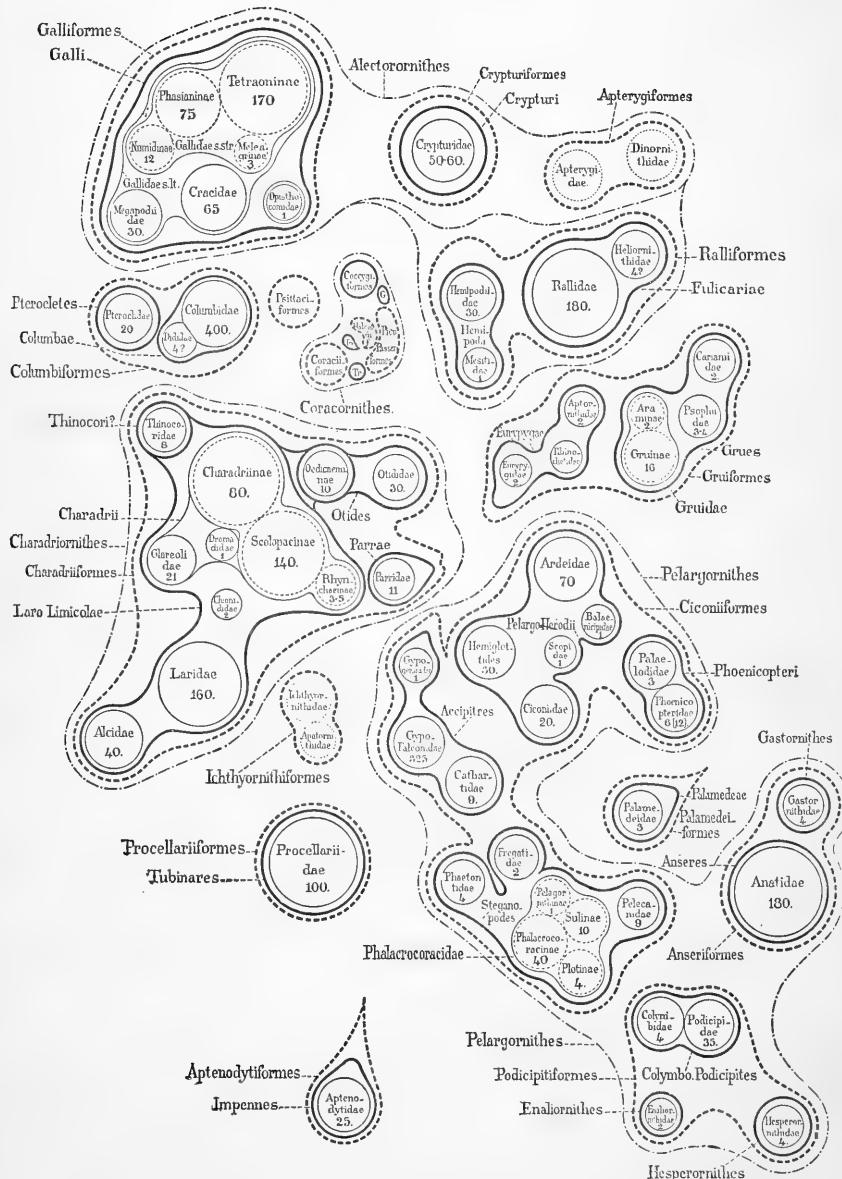
PLATE IV.—VERTICAL ASPECT OF FÜRBRINGER'S PHYLOGENETIC TREE OF BIRDS from the side of the Aptenodytiformes, Procellariiformes, Charadriiformes, Columbiformes, and Galliformes. [Copied, by the Author's permission, from his memoir entitled "Untersuchungen zur Morphologie und Systematik der Vögel," published in the 'Bijdragen tot de Dierkunde,' Amsterdam, vol. xv. Taf. xxvi. (1888).]

PLATE V.



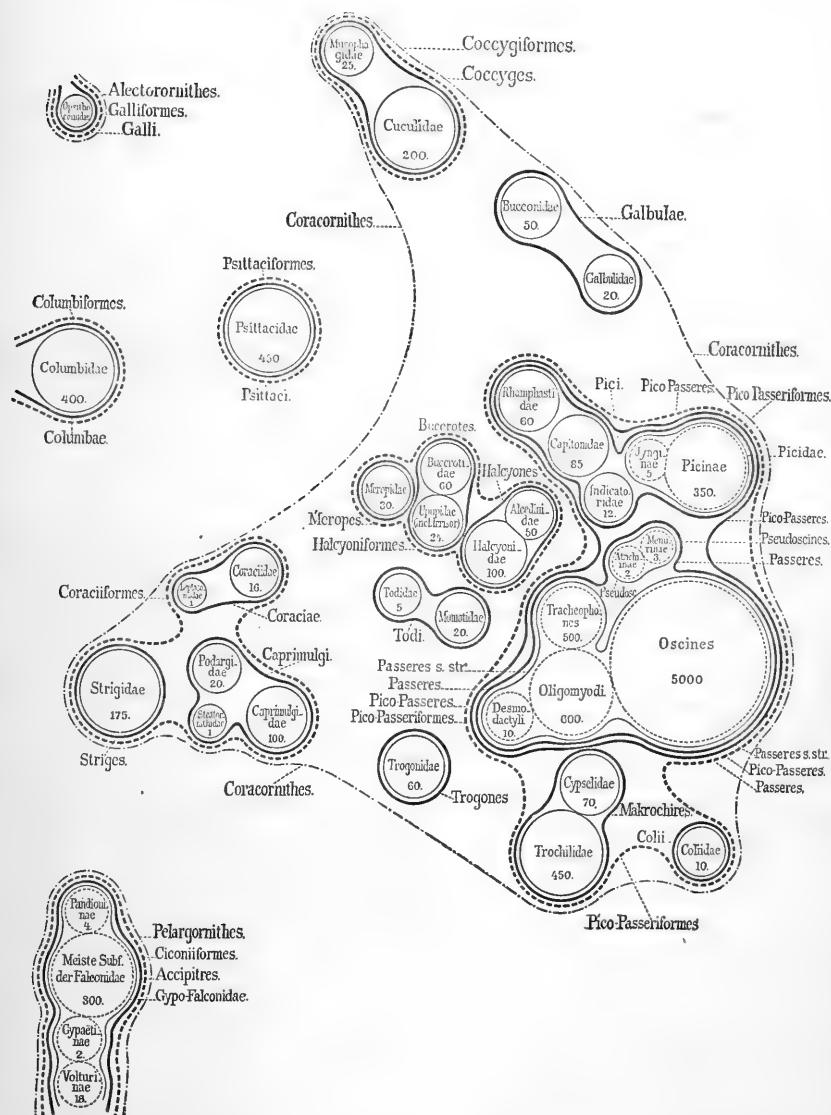
LOWER HORIZONTAL PROJECTION OF FÜRBRINGER'S PHYLOGENETIC TREE  
OF BIRDS. (Bijdragen tot de Dierkunde, vol. xv. Taf. xxix. a.)

## PLATE VI.



MIDDLE HORIZONTAL PROJECTION OF FÜRBRINGER'S PHYLOGENETIC TREE  
OF BIRDS. (Bijdragen tot de Dierkunde, vol. xv. Taf. xxix. b.)

## PLATE VII.



UPPER HORIZONTAL PROJECTION OF FÜRBRINGER'S PHYLOGENETIC TREE  
OF BIRDS. (Bijdragen tot de Dierkunde, vol. xv. Taf. xxx.)

Last year (1890) Mr. H. Seebohm published his 'Classification of Birds; an attempt to diagnose the Subclasses, Orders, Suborders, and some of the Families of existing Birds.' Several papers on classification in 'The Ibis' were contemporaneous with or paved the way for this completed scheme. Like Dr. Stejneger, Mr. Seebohm gives diagnoses for every one of his divisions; and he arranges his classification in a most convenient tabular form, by which can be seen at a glance the diagnostic characters of each Suborder, so that it is possible to see to what extent these characters are shared by the other Sub-orders of Birds.

Mr. Seebohm discards the fossil birds entirely, differing in this respect from Prof. Fürbringer. I do not agree with him altogether, but I reproduce his reasons:—

"Once for all it must be noted that any attempt to bring all fossil birds into the same system of classification as those now living is bound to fail. Between every two closely-allied groups of existing birds there must have been birds now extinct, the common ancestors of both, most probably differing from both, and partly resembling both, and incapable of being classified with either. To encumber the classification of existing birds with a few scattered links in endless chains of intergrading forms can only create confusion. The classification of fossil birds is a most interesting inquiry, and might be called the study of a vertical section of the bird-life which has existed in past geological ages. The classification of existing birds is the study of a horizontal section of the great bird-mass of the world, and ought to form a different and distinct system confined to the horizon of the present time."

He then divides the Class 'Aves' into six Subclasses, 14 Orders, and 36 Suborders, as follows:—

Subclass.	Order.	Suborder.
PASSERIFORMES ....	i. PICO-PASSERES .....	1. Passeres. 2. Eurylaemi. 3. Trochili. 4. Scansores. 5. Upupæ. 6. Trogones. 7. Columbæ. 8. Musophagi. 9. Cuculi.
FALCONIFORMES ....	ii. COLUMBÆ .....	10. Serpentarii. 11. Accipitres. 12. Striges. 13. Psittaci.
CORACIFORMES ....	iii. COCCYGES .....	14. Halecyones 15. Coraciæ. 16. Bucerotes. 17. Cathartes.
	iv. RAPTORES .....	
	v. PSITTACI .....	
	vi. PICARLÆ .....	
	vii. CATHARTES * .....	

\* Afterwards changed to *Mimogypes*.

Subclass.	Order.	Suborder.
ANSERIFORMES.....	viii. PELECANO-HERODIONES	18. Steganopodes. 19. Herodiones. 20. Plataleæ. 21. Phœnicopteri.
	ix. LAMELLIROSTRES .....	22. Anseres. 23. Palamedeæ. 24. Tubinares. 25. Impennes. 26. Gavieæ. 27. Limicolæ. 28. Grallæ.
	x. TUBINARES .....	29. Fulicariae. 30. Pygopodes. 31. Gallinæ. 32. Crypturi.
	xi. IMPENNES .....	33. Aptyrges. 34. Rhea.
GALLIFORMES .....	xii. GALLO-GRALLÆ .....	35. Casuarii. 36. Struthiones.
	xiii. APTERYGES .....	
STRUTHIONIFORMES .....	xiv. RATITÆ .....	

Mr. Seeböhm then offers an "alternative scheme," founded principally on the condition of the young when hatched. This character has before been considered of value by naturalists, and the late Professor Sundevall made use of it in his classification; but it is liable to exceptions, and even now is sufficient to break down some of Mr. Seeböhm's diagnoses. In this "alternative scheme" the linear sequence of the Orders is slightly altered and only five Subclasses are recognized. The result is as follows:—

Subclass.	Order.	Suborder.
1. PASSERIFORMES .....		1-9.
2. CORACIIFORMES ..	PICARLÆ .....	10. Halcyones. 11. Coraciæ. 12. Bucerotes.
3. CICONIIFORMES ..	CATHARTES .....	13. Cathartes.
	PSITTACI .....	14. Psittaci. 15. Striges.
	RAPTORES .....	16. Accipitres. 17. Serpentarii.
	PELECANO-HERODIONES .....	18. Plataleæ. 19. Herodiones. 20. Steganopodes.
4. GALLIFORMES .....	TUBINARES .....	21. Tubinares. 22. Impennes.
	IMPENNES .....	23. Palamedeæ. 24. Anseres.
	LAMELLIROSTRES .....	25. Phœnicopteri. 26-32.
5. STRUTHIONIFORMES .....	GALLO-GRALLÆ .....	33-36.

The diagnosis of the Passeriformes is vitiated by the genus *Menura*, which, although said to belong to the Passeriformes, has a downy nestling like that of a Petrel; and as Mr. Seebohm bravely stands or falls by his diagnosis, this portion of his scheme at least will require reconsideration.

As a matter of fact he soon returns to his first scheme, for in the 'Birds of the Japanese Empire' he admits six Subclasses, but the order is somewhat modified:—

1. PASSERIFORMES.
2. CORACIIFORMES.
3. FALCONIFORMES.
4. ANSERIFORMES.
5. GALLIFORMES.
6. STRUTHIONIFORMES.

The *Trogon*es are raised from a suborder to the rank of an order. The subclass *Coraciiformes* is placed between the *Passeriformes* and the *Falconiformes*, which brings the *Halcyones* after the *Coccyges*, the *Mimogypes*, however, still coming next to the *Bucerotes* and being followed by the *Psittaci* in the *Falconiformes*.

The chief objections to Mr. Seebohm's classification appear to be the placing of the *Columbæ* among the *Passeriformes*, the separation of the *Upupæ* from the *Bucerotes*, and the location of the *Mimogypes* in the *Coraciiformes*.

The *Columbæ* may not have downy young like those of a Hawk or a Game-bird, but they certainly have a very different nestling from that of an ordinary Passerine bird; and I am sure that this character alone, if properly examined, will separate the *Columbæ* from all the suborders with which Mr. Seebohm has allied them. Further than this, Mr. Ogilvie Grant, who is studying Game-birds, has drawn my attention to Gould's 'Handbook,' where the nestlings of *Geophaps* are distinctly stated to be Dasypædic.

Mr. Seebohm places the *Upupæ* in the Passeriformes because they have the plantars Passerine; but he does not attach equal importance to the Galline character of the perforation of the episternal process, though they share this character in common with the *Meropes* and the *Bucerotes*. The Desmognathous palate is also a character of the two last-named groups. The Hoopoes have a tufted oil-gland, but the forked spinal feather-tract is shared by the Hornbills and not by the Bee-eaters.

The Hoopoe lays whitish, unspotted eggs, and its nesting-place is in a hole, either of a tree, a wall, or a bank. The Hornbill has a white egg, which is laid in the hole of a tree. The male fastens up his mate and feeds her during the time of incubation, bearing the burden of the support of his wife, his nestling, and himself! But the habits of the Hoopoe during the nesting-season are somewhat Bucerotine (*cf.* Scott, *Ibis*, 1866, p. 222).

The Bee-eater burrows for itself a hole, lays white eggs, but the male is not known to box up his wife during the period of incubation. He seems to behave very like a Kingfisher. Therefore we may surely link the *Upupæ* with the *Bucerotes*, as has before been suggested by many naturalists, and place them near the Kingfishers and the Bee-eaters. What, then, becomes of the value of the plantar tendons? The *Upupæ* have Passerine plantars, but a Galline episternal process. The *Bucerotes* and *Meropes* have heteromorphous plantar tendons, but have also a Galline episternal process. Mr. Seebold will require a diagnosis for these groups, and also for his *Mimogypes*, which I shall bring back once more as a suborder of the Falconiformes. I give the characters after his own tabular form:—

#### MIMOGYPES.

- A. Hallux present and connected with the *flexor perforans digitorum*. [This excludes all other Suborders except the *Halecyones*, *Coraciæ*, and *Bucerotes*.]
- B. Episternal process not perforated to receive the feet of the coracoids. [This excludes the above-named Suborders.]

#### UPUPÆ.

- A. Deep plantar tendons free. [This excludes the *Gallinæ*, as well as the *Meropes* and the *Bucerotes*.]
- B. Episternal process perforated to receive the feet of the coracoids. [This excludes the *Oscines* and *Herodiones*, which possess character A.]

#### MEROPES.

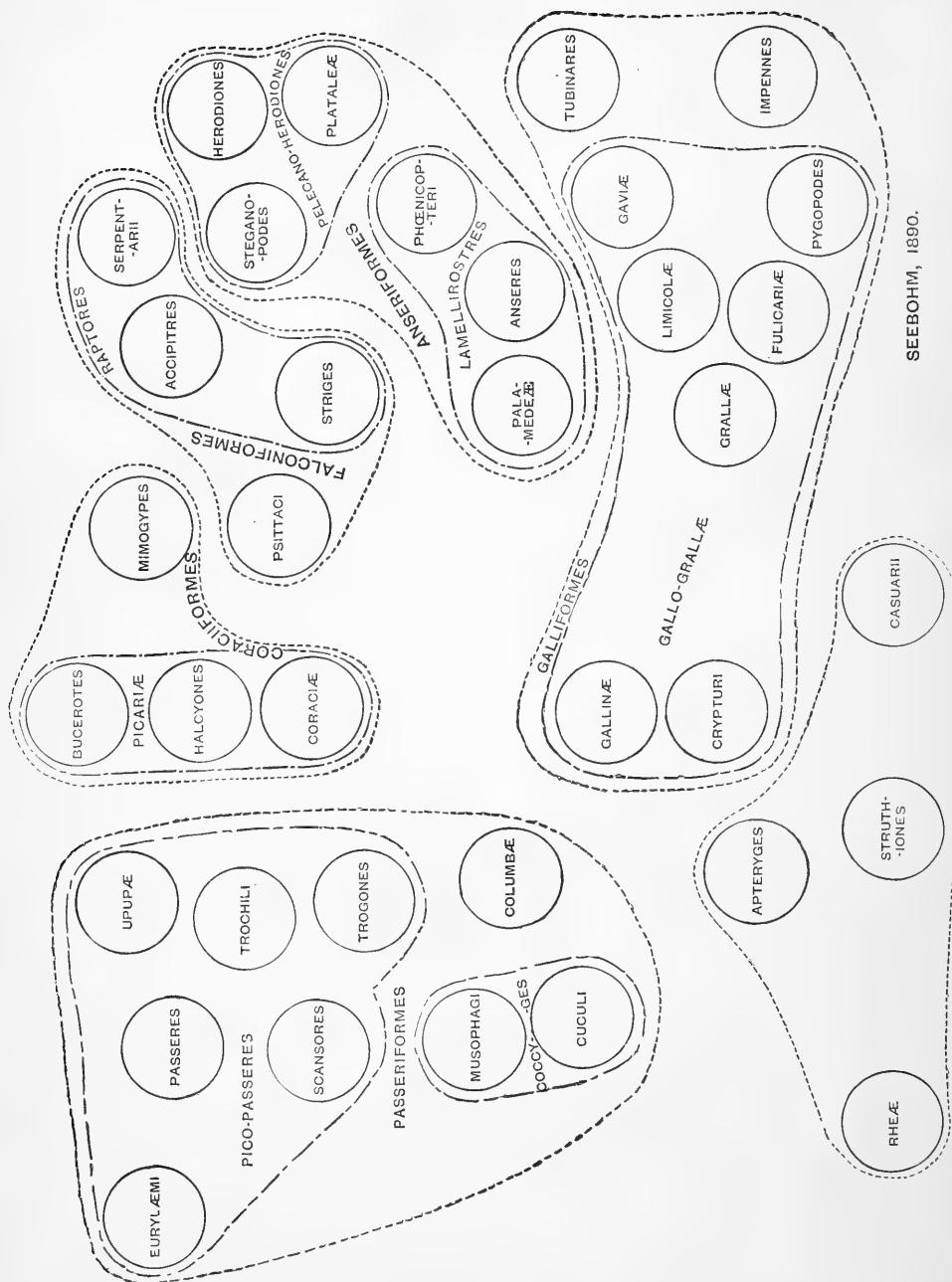
- A. Episternal process perforated to receive the feet of the coracoids. [This excludes the *Mimogypes* and all Suborders but the *Upupæ*, *Bucerotes*, and *Gallinæ*.]
- B. Hallux present and connected with the *flexor perforans digitorum*. [This excludes the *Gallinæ* and the *Upupæ*.]
- C. Spinal feather-tract well defined on the neck, but forked on the upper back. [This excludes the *Bucerotes*.]

#### BUCEROTES.

- A. Episternal process perforated to receive the feet of the coracoids. [This excludes the *Mimogypes* and all Suborders but the *Gallinæ*, the *Meropes*, and the *Upupæ*.]
- B. Hallux present and connected with the *flexor perforans digitorum*. [This excludes the *Gallinæ* and the *Upupæ*.]
- C. Spinal feather-tract not defined on the neck. [This excludes the *Meropes*.]

In order to make Mr. Seebold's arrangement clearer to my hearers, I have drawn up the following map (Plate VIII.) of his scheme for comparison with that of Professor Fürbringer and of my own which follows later.

## PLATE VIII.



SEEBOHM, 1890.

An attempt to illustrate Mr. Seebohm's arrangement of the Class  
'Aves' by means of a diagrammatic Map.

Apart from the excellent work which Dr. Hans Gadow has been producing in his edition of Bronn's 'Thierreich,' he has written a very important paper on the intestines of birds, entitled "On the Taxonomic Value of the Intestinal Convolutions in Birds," and published in the 'Proceedings' of the Zoological Society for 1889. Mr. A. H. Evans has given a very concise summary of the results obtained by Dr. Gadow, in the 'Zoological Record' for 1889, which seems to express all that is necessary :—

"The writer begins this exceptionally lucid and valuable paper with an account of the different varieties of intestinal convolutions in Birds and of their nomenclature. He next discusses, and represents in the plates, the 'taxonomic value of those characters which are exhibited by the modes in which the mid-gut is stowed away in the abdominal cavity'; and finds that the arrangements, of which he gives a table, are much more constant than was formerly supposed, both in species and in whole families. He agrees with Fürbringer in recognizing a combination Coracornithes. Among the conclusions, apart from this group, we may notice especially the deduction of an affinity between the *Columbæ*, *Limicoleæ*, and *Laridæ*, the *Steganopodes*, *Herodii*, *Tubinares*, and *Spheniscidæ*, with the intermediate position of the *Tubinares* between the *Laro-Limicoleæ* and *Steganopodes*, and, above all, some unexpected resemblances between the Pelargi and the Raptoreæ diurni. Within the Coracornithes the *Coccyges* are lowest (somewhat resembling the *Gallinæ* and *Opisthocomus*); the *Picidæ*, *Capitonidæ*, and *Rhamphastidæ* may be collectively termed Pici, and the *Coraciidæ* and *Alcedinidæ* Halcyones, leaving the other Picarian families in close connection, with the Striges further off. The Passeres are quite uniform in character."

A work which also bears upon the classification of the *Passeres* in particular is Mr. Oates's exposition of the order in the 'Fauna of British India.' I have already published a long review of this standard work in 'The Field' for 1890, and have expressed my views on the arrangement of Mr. Oates's work. The fundamental character on which he arranges his *Passeres* is the style of plumage of the young. The first naturalist to recognize the value of this peculiarity was apparently Mr. Seebold, who, by the character of the nestling plumage, separated the Thrushes from the Warblers (*cf.* Cat. B. Brit. Mus. v. pp. 1, 2). That the coloration of the young plumage is of great value in arranging the *Passeres* will doubtless be admitted sooner or later; for there is no character which gives us so good a clue to the ancient plumage of a group of birds as the style of the immature individuals at the present day. Thus we can easily imagine that the progenitors of the Thrushes, Chats, Redstarts, Nightingales, &c. were all profusely spotted, and that the more uniform plumage has been a matter of after-acquirement. In 1871 I pointed out in the 'Birds of Europe' the method by which Kestrels (*Cerchneis tinnunculus*) gain the adult plumage, shadowing forth by their change of garb in the present day the probable methods by which the first blue-headed and blue-tailed males were evolved from a stock wherein both sexes were alike rufous, such as is still seen in *Cerchneis rupicoloides* of South Africa.

Thus Mr. Oates separates his main families of the Passerine Birds under five heads:—

- a. With the plumage of the nestling resembling that of the adult female, but paler. (*Corvidæ, Crateropodidæ, Sittidæ, Dicruridæ, Certhiidæ, Regulidæ.*)
- b. Plumage of the nestling resembling that of the adult female, but brighter. (*Sylviidæ.*)
- c. Plumage of the nestling cross-barred. (*Laniidæ.*)
- d. Plumage of the nestling streaked. (*Oriolidæ, Eulabetidæ, Sturnidæ.*)
- e. Plumage of the nestling mottled or squamated. (*Muscicapidæ, Turdidae.*)

The other Passerine families eliminated from those before mentioned by a different set of characters are the *Ploceidæ, Nectariniidæ, Hirundinidæ, Fringillidæ, Motacillidæ, Alaudidæ, and Dicæidæ*, which make up the tale of the Acromyodian Passeres found in the Indian Region. I have already reviewed Mr. Oates's ornithological work so fully that it is not necessary for me to do more than express my opinion that it will rank among the most important of those produced in the latter half of this century. There is an additional advantage when a work like the 'Fauna of British India' is written by men of Mr. Oates's calibre, who combine with a minute technical knowledge the experience of many years spent in the jungle. Thus habits and customs of birds are considered of importance in determining their affinities, and by this means, perhaps better than by any other mode of classification, we shall arrive at sound conclusions.

Dr. Shufeldt in 1889 published his 'Contributions to the Comparative Osteology of the Families of North-American Passeres,' and arranged them in the following sequence:—

Order.	Suborders.	Families.
	<b>Clamatores.....</b>	1. Tyrannidæ. 2. Laniidæ. 3. Ampelidæ. 4. Hirundinidæ. 5. Alaudidæ. 6. Certhiidæ. 7. Vireonidæ. 8. Motacillidæ. 9. Sylviidæ. 10. Coerebidae. 11. Mniotiltidæ. 12. Cinclidæ. 13. Troglodytidæ. 14. Turdidae. 15. Paridæ. 16. Taragridæ. 17. Fringillidæ. 18. Icteridæ. 19. Sturnidæ. 20. Corvidæ.
<b>PASSERES .....</b>	<b>Oscines .....</b>	

I proposed in 1890 the following alternative scheme, so as to include all the Old-World representatives.

1. Corvidæ (Crows).	19. Nectariniidæ (Sunbirds).
2. Paradiseidæ (Birds of Paradise).	20. Dicæidæ (Flower-peckers).
3. Ptilonorhynchidæ (Bower-birds).	21. Paridæ (Titmice).
4. Sturnidæ (True Starlings).	22. Regulidæ (Goldcrests).
5. Eulabetidæ (Tree-Starlings).	23. Laniidæ (Shrikes).
6. Artamidæ (Swallow-Shrikes).	24. Ampelidæ (Chatterers).
7. Dicruridæ (Drongos).	25. Vireonidæ (Greenlets).
8. Oriolidæ (Orioles).	26. Sylviidæ (Warblers).
9. Icteridæ (Hangnests).	27. Turdidæ (Thrushes).
10. Ploceidæ (Weaver-birds).	28. Cinclidæ (Dippers).
11. Tanagridæ (Tanagers).	29. Troglodytidæ (Wrens).
12. Cœrebidae (American Creepers).	30. Accentoridæ (Accentors).
13. Fringillidæ (Finches).	31. Timeliidæ (Babblers).
14. Alaudidæ (Larks).	32. Pynonotidæ (Bulbuls).
15. Motacillidæ (Wagtails and Pipits).	33. Campophagidæ (Cuckoo-Shrikes).
16. Mniotiltidæ (American Warblers).	34. Muscicapidæ (Flycatchers).
17. Certhiidæ (Creepers).	35. Hirundinidæ (Swallows).
18. Meliphagidæ (Honey-eaters).	

It may be as well to reproduce the concluding sentences of 'The Field' review of Oates's book :—

"As with Dr. Shufeldt's arrangement, so with ours, there are one or two awkwardly placed families. It is annoying to have to separate the *Paridæ* so far from the *Certhiidæ*; but we do not see where else to put the *Meliphagidæ*. The *Sturnidæ*, too, are further from the Crows than we should prefer to see them; but if we begin with the *Corvidæ*, which we think it is desirable to do, the transition to the Paradise-birds seems natural, and thence the way is easy through *Xanthomelus* to *Amblyornis*. Then comes a break; for we do not think that there is any real affinity between the Orioles and the Bower-birds, and the *Sturnidæ* come here as the nearest position available in the vicinity of the *Corvidæ*. Recognizing the sense of Mr. Oates's family *Eulabetidæ*, we can pass by way of *Calornis* to the *Oriolidæ*, and thence to the *Artamidæ* and *Dicruridæ*. It would not surprise us if, when the osteology and anatomy of these two last families are worked out, they are taken completely away from their present position and placed nearer to the *Muscicapidæ* or the *Laniidæ*. At present we do not know any better place to put them. That the Orioles of the Old World and the Orioles of the New World should come somewhere near each other is convenient, and then the passage to the Weavers, Tanagers, and Finches is easy; but the position of the *Cœrebidae* does not quite please us. The latest exponent of the group, Dr. Sclater, considers that they are related to the *Tanagridæ* on one hand and to the *Certhiidæ* and *Mniotiltidæ* on the other. Dr. Shufeldt places them next to the latter family, and it may be that their *Mniotiltine* will override their Tanagrine affinities. We have already alluded to the connection between the *Alaudidæ* and *Fringillidæ* by means of the Horned Larks and the Snow or Lapland Buntings, and by placing the *Motacillidæ* next in order we can proceed to the *Mniotiltidæ* by way of *Sivurus*, as Dr. Shufeldt has pointed out. From *Mniotilla* to *Certhia* seems an easy transition, and then, no doubt, we ought to go to the Nuthatches and Tits. But we can find no more convenient position than this for placing the *Meliphagidæ* and the *Nectariniidæ*, and the thread of continuity is once more taken up by the *Dicæidæ*, which form a good connecting link with the *Paridæ* by way of *Prionochilus*, *Pardalotus*, but above all by *Oreocaris*. From *Paridæ*

to *Laniidae* the road is bridged by *Falcunculus*, and probably here will have to come some of the aberrant *Liotriches*, which are most puzzling birds to locate. We follow Mr. Oates in placing them as Timeliine birds, but both our family *Timeliidae* of the 'Catalogue' and Mr. Oates's family *Crateropodidae* have too ample limits.

"The *Vireonidae*, according to Dr. Shufeldt, are more Mniotiltine than Laniine, and the importance of their form of bill has been exaggerated, while the *Laniidae* have got such remarkable osteological characters that Dr. Shufeldt has put them on the boundary of his Passeres. Mr. Oates, for quite other reasons, also puts them far from the *Paridae*. Whether our position for the Shrikes is natural is a fair subject for discussion, our chief objection to it being that it separates the *Sylviidae* so far from the *Mniotiltidae* in the linear series. Once, however, that we have passed this break in the natural order, and we arrive at the *Sylviidae*, the affinities of the *Turdidae*, *Cinclidae*, and *Troglodytidae* are evident, the Accentors are probably rightly placed in proximity, and the *Timeliidae* in their comprehensive sense follow. The affinities of some of these birds with the *Muscicapidae* are closer than would be imagined; but Mr. Oates's favourite character of the spotted young is of great use in determining the limits of these two families."

Quite recently has been issued the 'Nomenclator Musei Heineani Ornithologici,' by Dr. Ferdinand Heine and Dr. Anton Reichenow, which, though it bears the date "1882-1890," was to all intents and purposes only published last year. I myself had never heard of the work until it appeared in its completed form. This 'Nomenclator' brings once again before our notice the Ornithological Museum which has been formed by Ferdinand Heine the elder at Halberstadt. Not only is it one of the most famous private collections of birds (5187 species and nearly 12,000 specimens), but it will also be celebrated to all posterity as having furnished the material from which arose much of the fame of our venerable colleague, Dr. Cabanis. To us at the present day, this new presentment of the contents of Heine's Museum is especially interesting, as it is the latest amplification of the systems of Dr. Cabanis in the original 'Museum Heineanum,' and of Dr. Reichenow in the 'Vögel der Zoologischen Gärten.' Remembering, too, the good work done in times past by Ferdinand Heine, the son of the founder of the 'Museum Heineanum,' it is pleasing to see that he has not lost his interest in Ornithology, but that on the contrary he has joined with Dr. Reichenow in the publication of the 'Nomenclator.' The exact share of the two authors in the latter work is not stated, but there is apparently more Heine than Reichenow in it. A comparison of the system adopted in this work shows that some modifications have been introduced into the arrangement of the 'Museum Heineanum' since its first publication (1850-63). Heine is a purist of purists, but whether ornithologists will follow him to the bitter end which he advocates remains to be seen.

Speaking for myself, although I feel a kind of satisfaction at seeing the unclassical names of Bonaparte (immortalized as the inventor of such names as *Moquinus tandonus*, *Blythipicus*, *Lichtensteinipicus*, *Graydi-*

*dasculus*, and numerous other barbarities) sent to the winds, yet I doubt very strongly whether Dr. Heine, in his classical rage, has not burdened us with a quantity of names which will never be used, any more than were those which he has superseded. We have in the 'Nomenclator' an example of purism carried to its fullest extent. In the Code of Nomenclature and Check-list of North-American Birds adopted by the American Ornithologists' Union, we have (p. 47) Canon XXXI. :— "Neither generic or specific names are to be rejected because of barbarous origin, for faulty construction, for inapplicability of meaning, or for erroneous signification." We may well begin to despair of arriving at a uniform system of nomenclature.

An outline of Reichenow's Classification having been given (*anteà*, pp. 16–21), which can be compared with that of the 'Nomenclator,' I will only add a few words concerning the modifications which affect the arrangement of the old 'Museum Heineanum.'

These consist principally in the removal of the subfamily *Campephagineæ* from the neighbourhood of the *Muscicapidae*, and their location in the *Brachypodidae*. The *Chalybeinæ* (containing *Lycocorax* and *Chalybeus*—*Manucodia*) and the *Eurycerotinæ* are two new subfamilies of the *Paradiseidæ*; and the *Phonygaminæ* of the 'Museum Heineanum' become the *Gymnorhininæ* of the 'Nomenclator.' The *Todi* are removed from the *Todinae* of yore, for which the name of *Triccinæ* is now substituted, and the *Psarinæ* are now called the *Tityrinæ*. *Heteropelma* is shifted from the *Ampelinae* to the *Piprinæ*. The *Tödidæ* are placed between the *Phytotomidæ* and the *Prionitidæ*.

The arrangement of the "Scansores" is very differently treated in the 'Nomenclator,' varying from that of the 'Museum Heineanum' and from that of Reichenow. The *Musophagidae* and *Coliidæ* are placed among the *Strisores*. The *Iynginæ* are a subfamily of the *Indicatoridæ*. *Opisthocomus*, placed in the 'Museum Heineanum' between the *Indicatoridæ* and *Cuculidæ*, is now more properly removed to the vicinity of the *Cracidæ*, and it is probable that this will be the proper resting-place of the family.

The later Orders and Families of birds do not occur in the 'Museum Heineanum,' and are set forth for the first time in the 'Nomenclator,' so that we have to notice some of the modifications which affect the classification of Reichenow of 1882.

The Order (XI.) *Natatores* (Nomencl. p. 340) supplants the Orders *Steganopodes* (IV.) and *Lamellirostres* (V.) of Reichenow in 1882, and some of the families recognized at the latter date are now accorded the rank of subfamilies only.

The 10th Order, *Grallatores*, of the 'Nomenclator,' is equivalent to Series III. of Reichenow's System of 1882; but the order is slightly altered, and some new families are introduced, notably the *Dicholophidæ*

and *Psophiidae*, which are placed near the *Gruidae*, while the *Palaemeidae* are removed from the neighbourhood of the *Anseres*, and placed between the Rails and the Cranes. The authors seem also to incline to the belief that the Struthious birds are not so remotely connected with the Game-birds (this Mr. Seebold has also hinted), and they arrange their "*Brevipennes*" to follow the *Rasores*. Here may I suggest to Dr. Heine that if he wishes to preserve his reputation as the most exacting purist of the day, he must write *Ortalis* (nominative) instead of *Ortalida* (accusative), as has been pointed out by Dr. Henry Wharton (*Ibis*, 1879, p. 450)? The *Deserticolæ* of Reichenow in 1882 are now included in the Order *Rasores*. They formerly consisted of the *Pteroclidae*, *Thinocoridae*, and *Ortygidae* (Hemipodes) and they now appear at the head of the *Rasores*, following the Pigeons and being followed by the Partridges. The *Crypturi* are only considered to be a family of *Rasores*.

The *Raptatores* are divided into the following families, *Strigidae*, *Falconidae*, and *Vulturidae*, much as in Reichenow's System of 1882, but the disposition of the Subfamilies is different. The *Falconidae* have eight Subfamilies:—1. *Accipitrinae* (to which the following genera, which I have placed in other Subfamilies, are said to belong, viz., *Rypornis*, *Asturina*, *Buteola*, *Leucopternis*, *Asturinula*, *Harpagus*, and *Herpetotheres*); 2. *Circinae*; 3. *Falconinae*; 4. *Milvinæ*; 5. *Buteoninae*; 6. *Aquilinae* (wherein occurs *Pandion*); 7. *Spizaetinae* (with *Harpyhaliaetus*, *Morphnus*, and *Thrasaetus*, which I consider Buteonine birds); 8. *Polyborinae* (with which are marshalled *Heterospizias*, *Hypomorphnus*, and *Erythrocnema*).

It may be mentioned that the authors of the 'Nomenclator' do not seem to be acquainted with some of the recent American works, or they would have superseded my generic names of *Enops* and *Erythrocnema* by *Rhinogryphus* and *Antenor* of Ridgway, for when, to my disadvantage, the first part of my first volume of the 'Catalogue of Birds' was printed off, and my names could not be changed, Professor Ridgway suddenly brought out a paper which superseded most of my work as far as American Birds of Prey were concerned.

It would be impossible to close this portion of my subject without a reference to the energetic labours of Dr. Shufeldt in America, combined with those of Mr. F. A. Lucas, A. Jefferies, and others who are working with success at the osteology and comparative anatomy of birds.

English Ornithologists may be forgiven if they say of some of their number that "whom the Gods love, die young," for the inestimable loss which Ornithology sustained in the deaths of Garrod and Forbes was still further accentuated by the death, at the early age of 24, of Mr. Richard Wray, whose papers on Avian Pterygraphy prove him to

have been a most accomplished observer. The study of Pterylography is being pursued by two British Ornithologists, Mr. Pycraft and Mr. Goodchild, the last-named having recently published an essay on "The Cubital Coverts of the *Euornithæ* in relation to Taxonomy" in the 'Proceedings of the Royal Society of Edinburgh' (vol. x. pp. 317-333). Some of the conclusions arrived at in Mr. Goodchild's 'Tabular View' are curious, as, for instance, when he shows that the *Paradiseidae* are without median coverts, a character peculiar to the *Cypselidæ*, *Trochilidæ*, and *Trogonidæ*. The subject is a very interesting one for systematists, and the characters brought forward by Mr. Goodchild may prove of some value in the classification of birds.

What is wanted now is that a practised osteologist like Dr. Shufeldt should give us diagnostic characters for the families, such as Huxley, in 1867, and Seebold, in 1890, have given for the Orders and Suborders of Birds, and the benefit to Ornithological Science would be enormous.

Ladies now, too, are in the field, and foremost among them are Miss Lindsay, with an essay on the Avian Sternum (P. Z. S. 1885, pp. 681-716); Mdlle. Fanny Bignon, who has written a considerable memoir in the 'Mémoires de la Société Zoologique de France' (1889), pp. 260-320, pls. x.-xiii.\*; and Miss Mary Walker, whose essay "On the form of the quadrate bone in Birds" was published in 1888 in 'Studies from the Museum of Zoology in University College, Dundee.'

Just as this Address was going to press, Mr. Lydekker's 'Catalogue of the Fossil Birds in the British Museum' appeared. I have no space left to do justice to this work, which will be extremely useful to Ornithologists, the arrangement of the *Ratitæ* and the descriptions of specimens being very important.

I have endeavoured in the foregoing pages to take up the parable of Professor Newton, and to bring the history of the Classification of Birds up to date. I have, of course, not been able, within the limits of a Presidential Address, to enter into the subject with the minuteness of an author in the 'Encyclopædia Britannica,' but I have tried to place before you the various schemes of classification propounded during the last few years; and if, by accident, I have omitted to mention the work of any of my contemporaries, I can honestly say that it is a fault of omission, not of intention, and that in a review of a subject like the Classification of Birds it is not always certain that one can pick up all the threads which are scattered over a very wide area.

I now proceed to the more strictly personal portion of my Address; for my colleagues will expect that, having criticized the classifications of my forerunners, I should give them some of my own ideas on the arrangement of Birds. But I must state at the outset that I would

\* "Contributions à l'étude de la pneumacité chez les Oiseaux. Les cellules aériennes cervico-céphaliques des Oiseaux et de leurs rapports avec les os de la tête."

rather do this ten years hence, did I live so long. Although claiming to have some knowledge of *Accipitres* and *Passeres*, and certain groups of *Picariae*, my acquaintance with the other orders is but that of every Museum Curator, and I should have preferred to keep silence on the great subject of Classification until, by the close study of the Game-birds and Water-fowl in the 'Catalogue of Birds,' I had gained a more intimate acquaintance with these members of the Class "Aves." At the same time it is in the hope that I may add a "brick" or two to the structure of the Classification of Birds that I am emboldened to carry the subject of my Address a little further.

The building-up of the Natural Classification of Birds resembles the construction of a building, to which each earnest labourer in the field of Ornithology contributes his quota. Sometimes the structure has to be altered and amended, but it is seldom that a labourer, whose soul is in his work, retires without having added something in the shape of useful materials. It takes a long time—it may be years of study—before a sound brick is baked; and there is evidently some temptation now-a-days to take other people's bricks without acknowledgment, and with them to construct a temple of one's own.

It is certain, however, that by this "brick"-making materials for the structure of the Classification of Birds will be slowly gathered; and our difficulty at the present day lies in the fact that so many of our foundations are insecure, irretrievably buried in the sands of the past. At the same time, it is impossible to look back upon the history of Ornithology during the past twenty years without recognizing that an immense amount of good work has been done, that a number of sound "bricks" have been made; and the materials seem to be gradually accumulating from which a solid structure may be built. It is not for me to say more on this subject, regarding as I do at this moment the faces of so many Ornithologists who have helped to build up our science. Rather let me add some words of advice which concern every one of us, in the words of our great English poet, Sir Edwin Arnold :—

"Live day by day  
By little and by little swelling  
Thy tale of duty done—the way  
The wise ant-people build their dwelling."

And, further, I would remark that no critic should interfere with the building of our structure who does not give reasons for his spoliation of the work. In later years we have had too much criticism, but few attempts at reconstruction. This may be due, no doubt, to the wise caution of the writers who never commit themselves, who pull down, or at least try to do so, but who never reconstruct—who damage a "brick" in the building, but never replace it by a new one. To criticize is the easiest thing in the world; to damage the "bricks" of

PLATE IX.

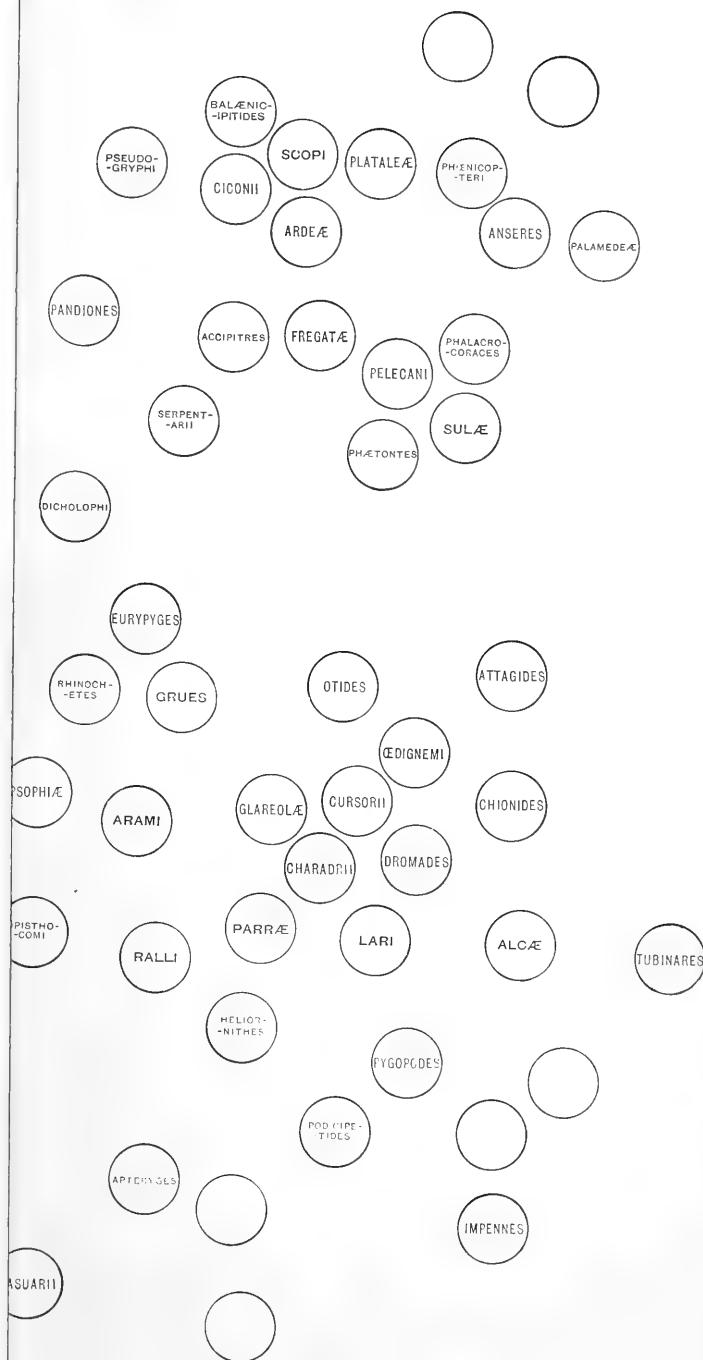
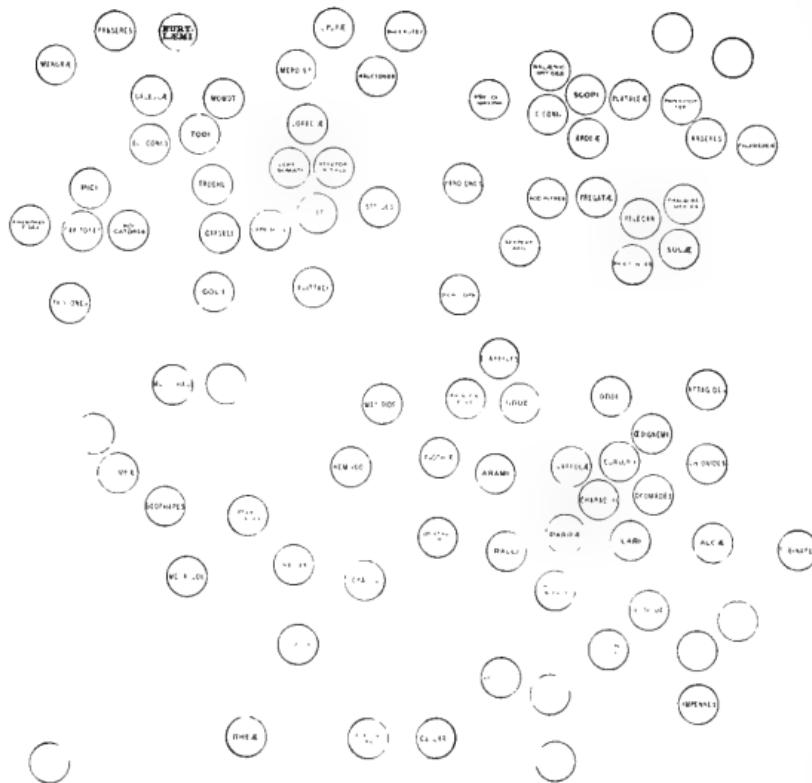
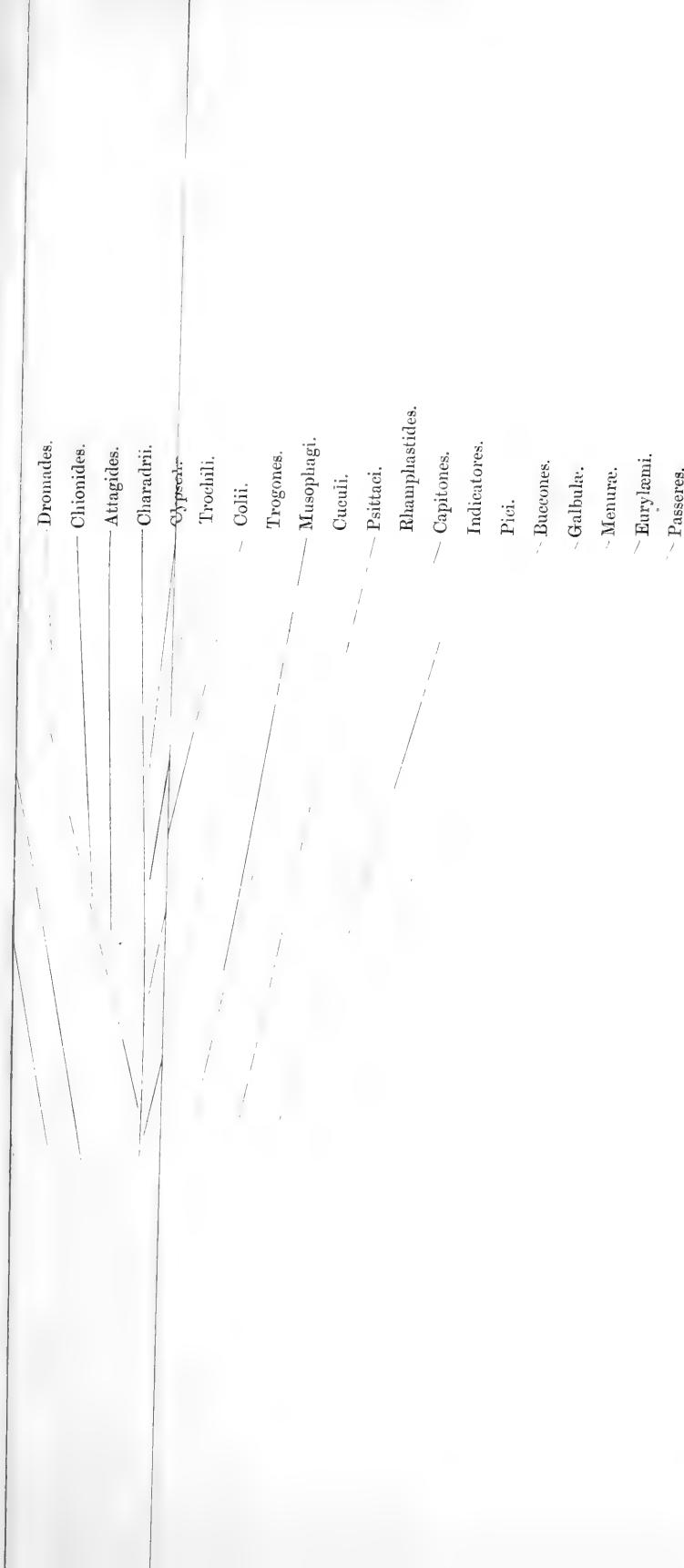




PLATE IX.













an author's construction is a cheap way of gaining notoriety; but to show what should have been done originally, and to replace the damaged "brick" by a sound one,

"Hoc opus, hic labor est."

In Plate IX. I venture to put forward an arrangement of the Class "Aves" framed on a somewhat different idea from those of my predecessors; and it will be observed that I have not attempted an arrangement under the headings of Subclasses or Orders, with their accompanying minor groups. Here are merely the birds which now exist, with some of their allies which have perished; and the groups which are un-named in my map of the Class will be found later on (*infra*, pp. 67-88), where I have re-drawn my scheme (Pl. XII.), taking into account the classifications of Fürbringer and Sebohm.

From the map (Plate IX.) which is here presented I have drawn up a phylogenetic scheme (Plate X.) to test the correctness or incorrectness of my views; and it will be seen that I have not treated my subject quite on the same lines as those pursued by Reichenow and Fürbringer. For this reason: by the model of the "tree" which is on the table, we see that Fürbringer, and before him Reichenow, adopted the figurative notion of a tree *literally*; and this plan, excellent in every other respect, seems to me to fail in one particular, in that it subordinates the fact of the persistence of certain types to the present day. Such types may be of ancient differentiation—that no one may question; but the fact remains that they exist in our own Epoch.

Thus, if it were possible, we should stand at the foot of the Avian tree—or, to speak more correctly, of the main Avian *branch* of the tree when the Birds had split off from the Reptiles. We could look up into the many spreading branches and twigs of "Aves," could note those which had died out or were expiring, and nowhere should we get this allegory more completely fulfilled than in the pictures of Fürbringer.

But the ornithological tree is a different one from a natural tree. It is one in which all the surviving branches have reached the same level, and the only difference in their appearance, as we see them on the topmost horizon, is that whereas one bough has struggled to the top, and many of its branches have died off in the process, another bough comes to the summit of the tree full of smaller branches and flourishing twigs.

Thus we ought, if we wish to arrive at a knowledge of the present state of our ornithological tree, after standing at its base and studying the development of its many branches in different directions, to take a flight in an imaginary balloon, from which to look down upon the summit of the tree, so as to see what branches have attained to the top. The result would, I hope, be something like the map which I place before

you this evening ; and my faith in this form of illustration has not been shaken since the time when, little more than a boy, I adopted the method for showing the evolution of Kingfishers in 1871 (see p. xlv of my Introduction to the 'Monograph,' and frontispiece).

It may, however, be said that this is all very good in theory, but how do you propose to put your ideas into practical shape ? This, I confess, touches the root of the matter. My arrangement of the Class "Aves" is derived from a conviction that the only practical method of teaching or studying Ornithology in the present day is from the standpoint of Evolution, and it is a simple duty to try and arrange the groups of birds on this plan.

Let us therefore imagine ourselves called upon to take charge of a collection of birds for the instruction of students and of the public in Ornithology. No Museum that I have seen as yet is so constructed that this plan is feasible, and such an arrangement as I have suggested in my map is at present impossible ; nor would it be right to bind posterity by the erection of buildings for the illustration of our own pet theories, which may be upset in the course of time, as theories have often been before now. There may, however, come a day when wall-cases will play a subordinate part, and the illustration of natural objects be carried out by the exhibition of groups, such as Dr. Günther has adopted in his delineation of our British birds at the Natural History Museum in South Kensington.

The realization of my ideal plan of a Museum of Birds would require a fivefold division of the subject.

The first exhibition should be strictly rudimentary, and should instruct the student merely in the *technique* of Ornithology. This is rapidly being accomplished by Professor Flower at our Natural History Museum in London. A final step perhaps would be to arrange a series of illustrations which should represent the history of the Classification of Birds from the time of Linnaeus to the present day.

But having instructed our public in the rudimentary and elementary facts connected with Ornithology, it now remains to prepare the figurative cases which are to illustrate the forms of birds which now inhabit, or have inhabited, the earth. If the system of teaching by artistic groups be adopted, then only the principal forms would require illustration, and a representation of the leading type of each order or suborder would suffice. A supplementary gallery might be provided, in which types of each family, subfamily, and genus of birds would be exhibited, but lower than genera I would never descend in a public exhibition.

The student of species should find his material in the "study" series, which should be under the special care of the Curator, and there each species should be amply illustrated by actual specimens showing

the plumage of both sexes at all times of the year, young birds in all stages, moulting individuals, and a full series exhibiting the complete geographical distribution and variation in the species, even if this requires a series of specimens. The days have gone by when the description of new species was the be-all and end-all of an ornithologist's hopes. The warfare over priority of nomenclature is fast showing signs of waning, and we can afford to leave to those who care for such distinction the cheap notoriety which attaches to the re-shuffling of names and the coining of new synonyms. Not but what I think, as I have always thought, that a great injustice has been done in many instances by the ignoring of the good work of many of our predecessors; and that their writings have not been recognized is surely not their fault, but the fault of their successors who have overlooked them. It is time, however, that by some such means as an International Congress of Ornithologists the names of the species of birds were settled once and for all, in order that we may turn our attention to the far more important facts of geographical distribution and life history of species. We are approaching a time when the study of rainfall and climate, of altitude and locality, and even the conditions of weather under which a specimen was procured, will be considered indispensable for the minute study which is to be our portion in the not very distant future.

To return to our proposed arrangement of birds in a Museum. I should begin with the *Saururæ*, as the most archaic form universally recognized as such by modern systematists. Thus *Archæopteryx* would first engage the attention of the student, and casts and pictures of the two known fossil specimens would be necessary, with, if possible, a restoration of a tail-feather, to show the absolutely different equipment of the earliest bird. A geological table would explain the age of the deposits in which *Archæopteryx* was found, and it ought not to be impossible to picture a restoration.

Next in order as archaic forms, with no very near relations in the present day, would come the *Ratitæ*, represented by natural groups of the Ostriches, Rheas, Emus, and Cassowaries, which should not only be illustrated naturally with their surroundings, their young and their eggs, but copious maps showing the past and present distribution of the groups, and references to the peculiar characteristics of these birds, should be made to an introductory series, where should be found illustrations of the Struthious skull, &c. Explanatory labels would draw attention to the external characteristics which separate the great groups of Struthious birds.

It will be impossible to illustrate the last-named groups without placing in juxtaposition some representatives of the *Dinornithes*, and an account at least of the *Aepyornithes*, so far as is known.

A little further afield we should come to the *Alpteryges*, and here

attention should be drawn to the Ralline tendencies of these abnormal *Ratite*, with all those other peculiar characteristics on which it is not necessary here to dilate at length.

In a similar manner our student would next be directed to the Tinamous or *Crypturi*, which should be placed on the path to the Game-birds, as Galline forms in which certain Struthious characters have persisted, while the peculiar nature of their eggs would not fail to excite comparisons with those of the neighbouring groups. The Tinamous are, in fact, Struthious Partridges, and the habits of some of them are thoroughly Partridge-like (cf. Hudson, in 'Argentine Ornithology,' ii. p. 210).

From the *Crypturi* the transition to the true Game-birds is natural, and here we should find several groups which, though classed together by most systematists, seem to me as well worthy of distinct recognition as the *Crypturi*. We may ask—What has a Megapode in common with a Pheasant? Or wherein lies the affinity of the Curassow, with its nest in a tree and its white egg, with a Partridge? Of course, we shall be referred to certain osteological and myological characters which demonstrate the affinity of these groups, and we do not deny their importance. But the result of our cases, showing the Megapode with its mound, the Pheasant with its numerous eggs on the ground, and the Curassow with its nest and two white eggs on a tree, would be sufficient to demonstrate how widely separated these three groups of Game-birds really are, while we should appeal to our maps of distribution to help us in their recognition.

Not far from the Quails among the *Phasiani*, we should come to the Hemipodii, a little group of Quail-like birds, with a skull akin to that of *Pterocles*\* and with Galline nestling. My colleague Mr. Ogilvie Grant is about to draw attention to several points in the osteology of the Hemipodes which show their truly Galline affinities. They lay, moreover, a double-spotted egg, which is also a Pterocline character.

Before leaving the true Game-birds it will be well to proceed a little further to the left of our imaginary Museum, to study the Sand-Grouse, which, although possessing a perfectly Galline nestling, yet exhibit osteological characteristics which are strikingly Columbine. They lay, however, a double-spotted egg, which is peculiar among Game-birds, and their habits and general surroundings are also emphasized enough to allow us to regard them as a perfectly separate group from both the Game-birds and the Pigeons. The latter would stand quite by themselves, and it should not be very difficult by means of a series of well-mounted groups to illustrate the economy of all the various forms which are included under the comprehensive title of the *Columbae*. More especially must we illustrate the *Geophapes*, with their Galline nestling.

\* Parker describes the palate of *Turnix* as incompletely ægithognathous.

It will now be necessary to return to the vicinity of the *Apteryges* to follow up the main stem of our phylogenetic arrangement, if we are to accept the weighty dictum of Professor Fürbringer, who places these Ratite birds in close proximity to the Rails, an arrangement which I have no difficulty myself in accepting, especially when the habits of *Apteryx* are considered: they answer very well to what we should expect from a *Ralline bird* of ancient pedigree, though I confess that the size and colour of the egg does not help us much. Any one who saw *Apteryx* in confinement, and knew nothing of its Struthious affinities, would consider it to be a clumsy kind of Rail.

Of the birds in our present category, *Opisthocomus* is the most curious, with its general appearance of a Curassow and its Gallinuline nest; while its faculty of climbing when young by means of its claw on the pollex and index digit, which has gained for it the name of the "Mammalian Bird," is also known to be shared by nestling *Porphyrio*, and Professor Newton has recorded an instance of a nestling Grebe (*Podiceps fluviatilis*) using its fore limbs as instruments of progression (*Ibis*, 1889, p. 577).

Proceeding next to the true *Ralli*, we should require to delineate the Rails with several illustrative groups of Gallinules, Coots, Rails, and Crakes, while by means of *Podica* and the *Heliorhithes* our path would lead to the *Podicipedides* and *Pygopodes*, which would not require many cases, as the habits and nesting of the species of these two groups are almost the same.

Here, however, we should find ourselves in the vicinity of two groups of birds, the Penguins and the Petrels, which seem to stand apart from all the other Pelagic Birds and must be illustrated separately. In the case of the *Impennes* this is not difficult, as one group would suffice; but for the *Tubinares* at least three cases would be required, that of the *Diomedaeidæ* demanding great space, while the Shearwaters and Stormy Petrels would also require considerable attention.

The next great groups to be arranged consist of the *Limicolæ*, the *Lari*, and the *Alcæ*. I do not agree with placing the Auks with the *Lari*\*. They seem to me to constitute quite a group by themselves, differing in habits, nestlings, eggs, and other characters from the Gulls; while in *Mormon* we have probably the nearest existing ally to the *Tubinares*, judging from its burrowing nesting-habits, its white egg, and the style of its downy nestling. Thus the Auks would require separate illustration as a group, and they must be placed furthest away from the *Ralli*, not far from the *Pygopodes*, and the nearest of all the groups to the outlying *Tubinares*.

\* Their diving habits and short wings should separate them from the long-winged Gulls and Terns. Some of the latter, however, lay an egg in style of coloration like that of a Guillemot (e. g. *Sterna bergii*), with almost an equal variation in colour and markings.

Admitting the close affinity of the *Charadrii* and the *Lari*, there intervenes between the *Charadrii* and the *Ralli* the very interesting group of the *Parræ* or Jacanas, which, though Pluvialine in essential structure, yet have so many Ralline affinities that it is impossible to deny to them a rank equal in value to the whole groups of *Charadrii* and *Ralli*.

The *Lari* are equally well defined, and would require at least four illustrative groups, to show *Stercorariidae* (Skuas), *Laridae* (Gulls and Terns), and Skimmers (*Rhynchopidae*).

The principal groups of the *Charadrii* could be easily disposed of: Plovers with their nest, or want of nest, their four pyriform eggs; and a few groups illustrative of the Snipes, with nests and eggs; while a separate section must be devoted to the Painted Snipes (*Rhynchæa*) and other minor forms of interest (*Strepsilas* and such like).

In the vicinity of the *Lari* and the *Charadrii* should be found a little congeries of forms, which, as they cannot rightly be said to belong to either one or other of the two groups named, must be treated as independent groups, though they are represented by but few individual genera. The group of Pratincoles contains but the genus *Glareola*, a Plover-like bird of singular habits and structure, connecting the true *Charadrii* with the Coursers (*Cursorii*), which lead on to the Thick-knees (*Edicnemi*), and thence to the Bustards (*Otides*), and later on to the Cranes (*vide infrà*). *Dromas ardeola*, the single representative of the *Dromades*, is in habits a Plover, in many points of structure Larine, but it burrows in the sand and lays a white egg, like that of a Petrel—surely a combination of characters which demand that it shall have a separate rank as the representative of a definite Suborder.

The Sheathbills (*Chionides*), too, stand equally alone. Their egg is something like those of a Thick-knee (*Edicnemus*) or of an Oystercatcher (*Hæmatopus*), though differing from both. The chicks show no likeness to the nestlings of those of either a Plover or a Gull, being entirely covered with slaty-grey down, and in structure they are intermediate between the *Charadrii* and the *Lari*, possessing also distinctive characters, which render them fit subjects for separation as a Suborder.

The same may be said of *Attagis*, which is Larine in some characters, and yet in habits and in other points of structure it is an aberrant kind of Plover, so that the best idea of its position is gained by keeping the genus also as a representative of a distinct group.

From the great division of the Limicoline birds we can approach the Grues, with their outlying allies. The true Cranes, of whose nesting-habits it might be difficult, but ought not to be impossible, to obtain an illustration, would also require considerable space; while *Aramus*, which we should treat as an intermediate group, to be termed *Arami*, would be placed between the Cranes and the *Ralli*, as representing the most Ralline of the Cranes.

The Trumpeters (*Psophia*) stand alone, being the most Galline of all the Crane-like birds. The peculiar *Mesites* of Madagascar also requires to be kept apart, as also the Sun-Bittern (*Euryypyga*) and the Kagu (*Rhinochetus*) of New Caledonia. All these are probably isolated survivors of Heron-like Cranes, of which the bulk have perished from the earth.

One of the most puzzling forms to locate naturally is the Cariama or Seriema, which I make to stand alone as the representative of the group *Dicholophi*. It has an outward resemblance to the Secretary-bird (*Serpentarius*) of South Africa, but has characters which, according to Seebohm, make it a Ralline bird, while Stejneger and others consider it to be Gruine. I place it as an independent form between the Cranes and the *Accipitres*, to which it apparently leads by way of *Serpentarius*.

My friend, Mr. Howard Saunders, carefully watched the habits of the Cariama when it was living in the Zoological Gardens. The curious way in which the Secretary-bird pounds a rat to pieces by jumping on it is shared by the Cariama. On the other hand, the latter roosts like a Game-bird, or a Bustard, with its feet folded under it, and not like a Hawk.

The Secretary-bird must also be admitted as a peculiar Accipitrine form, connected with the general body of Hawks by the Caracaras (*Polybori*) ; and it is doubtful whether we ought not to separate the Old-World Vultures as a distinct group. As, however, no one has found osteological or other characters of sufficient value for this "divorce," I still keep them with the other *Accipitres*, though their external appearance and habits go far to warrant their "judicial separation." They at least would require recognition as a distinct body of Birds of Prey in a separately mounted group, which should display their nesting-habits and carrion-loving propensities. After admitting that it would have been better in 1874, when I wrote my first volume of the 'Catalogue of Birds,' to have taken more heed of Huxley's wise separation of the New-World Vultures and the Secretary-bird as distinct groups, I have seen no reason to modify the rest of my classification of the *Accipitres*. The most Vulture-like of all the Hawks are the *Polyborinæ*, and from them to the Long-legged Hawks and Harriers (*Accipitrinæ*) is an easy transition. The Buzzards and Eagles form another tolerably well-defined congeries of genera, and from them to the Kites and thence to the true Falcons by way of *Baza* and *Pernis* does not seem to me in any ways difficult.

I still maintain the correctness of my opinion that the Ospreys are not Eagles at all, but represent an intermediate group between the *Accipitres* and the *Striges*. Their skeleton is in many respects Owl-like, and they have other characters in which they resemble the *Striges* ; but as their habits are those of a Fishing-Eagle and the egg is coloured

like that of many *Accipitres*, I keep them as a separate group, *Pandiones*. The placing of *Polioaetus* along with *Pandion* in the 'Catalogue of Birds' was an error, based on a misconception of facts.

Leading from the *Pandiones* we should next come across the *Striges*, but at a far distance with regard to space, for the Owls form a well-marked group by themselves. As a rule they lay white eggs in the hole of a tree or a wall; but the day-flying Owls, *Nyctea* and *Surnia*, and some others are exceptions, and therefore several illustrative groups would be necessary to show the very different forms which make up the aggregate of the *Striges*.

Further away still we should find the *Pseudogryphi*\* (*Mimogypes*, Seebold) or American Vultures. Their habits as carrion-eaters make them the representatives of the *Vulturidae* in the New World; but there are so many characters in which they differ essentially, even to the arrangement of the deep plantar tendons, which induces Mr. Seebold to place them near the *Bucerotes*, that it is impossible to locate them very close to the true *Accipitres*. The egg of *Rhinogryphus*, too, is very different from that of any true Accipitrine bird, being white, spotted all over with black.

On the other side of the *Accipitres*, the visitor to my ideal Museum would find the Frigate Birds (*Fregatæ*), the most Aquiline of the great division of the *Steganopodes*, or birds which have their four toes connected by a web. All the groups are well characterized, but I would also keep the Gannets distinct as a group (*Sulæ*) of equal value to the *Pelecani*, *Fregatæ*, and *Phaetkontes*, the latter in their mode of life, nidification, and colour of their egg being decidedly different from all the others. If the *Sulæ* are allowed to represent a group, the same rank cannot be denied to the Cormorants (*Phalacrocoraces*).

Of the Heron-like birds, at least *Scopus* and *Balaeniceps*, as well as the *Ciconii* or Storks, must be considered to rank as distinct from the general mass of the Herons (*Ardeæ*), and instructive groups illustrating the mode of life of all these birds would be necessary.

From the Herons we should pass to the group of *Plataleæ*, of which the Spoonbills and Ibises are the examples, and groups of both these forms of bird-life would have to be provided.

Then to the right of the *Plataleæ* would come those curious and anomalous birds, the Flamingoes, with some characters Duck-like, others Stork-like, which, combined with a nest and mode of life altogether peculiar, justify us in regarding them as an isolated group, which can be called *Phænicopteri*. Their Anserine affinity is proved by the nestling and by many other well-known features.

The *Anseres* may probably have to be split up into several minor groups of higher rank than is now generally admitted. As they are birds

\* Forbes's name has priority (*vide anteâ*, p. 9).

to which I have as yet given very little close study, I will not venture to pronounce any definite opinion on the subject ; but the various forms of Ducks and Geese would require several illustrative cases, while at some distance from the true *Anseres* would be placed the Screamers (*Palamedeæ*), which every one now admits to be aberrant Geese-like birds.

Having thus followed our arrangement to the extreme end of a series, we have to consider the vast mass of birds which under the general names of *Picarie* and *Passeres* seem to have no connection with any of the birds which we have hitherto been talking about. Of these, one group at least stands apart, that of the Parrots (*Psittaci*), which with certain Accipitrine characters combines a zygodactyle foot like so many members of the Picarian assemblage.

The Parrots, however, do not appear to have any very close allies. In the character of the nestling they are not in the least Accipitrine, and the development of their feathers is carried on in true Picarian fashion—that is to say, that the new feathers are enclosed in the sheath till they attain almost their normal length ; and in this respect the Parrots resemble Kingfishers and other Picarian birds. The mode of nesting, too, is Picarian.

All the remaining groups possess characters which distinguish them one from the other ; but the Picarie have one feature in common which is characteristic of nearly the whole Order, and that is, that they lay white eggs, which are concealed in the hole of a tree or a bank, being in the latter case often tunnelled by the birds themselves.

The principal exceptions to this rule are the *Coccyges*, consisting of the *Cuculi* and *Musophagi*, which are either parasitic, or build open nests of rough construction, and lay eggs, sometimes of varied colours, and sometimes white. These birds, however, though zygodactyle, possess other characters which seem to show that at the present day, at least, they have little to do with the other so-called *Picarie*, and in many respects exhibit Galline affinities. The *Caprimulgi* also are an exception to the Picarian rule as regards the colour of their eggs.

It was an old fancy that, because of a certain similarity in the style of plumage and because also of their crepuscular habits, the *Caprimulgi* and the *Striges* were nearly allied ; and though this idea is now scouted, it would seem that the nearest approach to the *Striges* among the various groups which we are now considering will be found in the *Steatornithes* ; and following on from them we should find, as separate groups, the *Podargi* and, at a distance, the *Caprimulgi*, whence we should pass to the *Cypseli* in one direction.

The Rollers (*Coraciæ*) seem to come next to the Goatsuckers, being somewhat connected with them by means of the peculiar *Leptosomati* of Madagascar.

The Kingfishers (*Alcedines*), Motmots (*Momoti*), and the Todies (*Todi*) are also well-marked groups, and the first of them might be arranged at no great distance from the Hornbills (*Bucerotes*). Nor can the Bee-eaters (*Meropes*) be placed far off the Kingfishers, though Mr. Seebold puts them in two different Subclasses, because of the arrangement of the deep plantar tendons. To do this, however (*anteā*, p. 44), he was compelled to ignore other characters apparently of equal importance.

I should be unwilling to banish the *Bucerotes* far from the great mass of Picarian groups, as they possess many characters beside the plantar tendons in common with these birds, though their peculiar nesting-habits render them unique in the series of the class.

Apart from the other affinities which the *Upupae* show in structure to the *Bucerotes*, it is also to be observed that they seem to have somewhat similar inclinations to feed the female on the nest during the period of incubation (*cf.* Scott, 'Ibis,' 1866, p. 222). This surely must count for something in making the Hoopoe an ally of the Hornbills.

I need not detain you long with an account of the other groups, for their identity and even their order in the natural arrangement are agreed upon by most of us. The Jacamars (*Galbuli*) and the Puff-birds (*Buccones*), though belonging to the Pico-Passeres, yet have a certain amount of connection with some of the foregoing groups, and may be placed somewhat in juxtaposition, though they are as different in outward appearance as birds well can be, and it will not surprise me if some day the *Galbulidæ* and *Bucconidæ* are put wide apart from each other; while the Woodpeckers (*Pici*), the Barbets (*Capitonæ*), Toucans (*Rhamphastides*), and Honey-Guides (*Indicatores*) must all be placed close together, as was long ago insisted upon by Garrod in 1878. The Trogons (*Trogonæ*) and the *Colii* are two somewhat separate groups, the former being perhaps the most isolated of any of the Pico-Passeres, while the Colies must also stand alone, a little group, between the *Cypseli* and the larger group of *Halcyones* &c., but without any very near relations.

To my arrangement of the Passeres, as published in the before-mentioned review of Oates's 'Fauna of British India,' I have little to add, but one or two corrections are necessary. Through the kind assistance of my friend, Professor Stewart, who has recently made some beautiful preparations of the skulls of birds to illustrate my forthcoming Catalogue of the Osteological Collection in the Museum of the Royal College of Surgeons, some very important characters have been brought to light.

The ossification of the olfactory capsule in the *Laniidæ* and the posterior spiny process of the palatines are characters which have already been brought into prominent notice by Dr. Shufeldt in his essay on

the 'Comparative Osteology of the Families of North-American Passeres,' and now we find, from a preparation of the skull of *Artamus leucogaster* recently made by Professor Stewart, that in the bony olfactory capsule and in the spine-like process of the palatines, *Artamus* is Shrike-like. Consequently my proposal to place the *Artamidæ* near the *Sturnidæ* and *Oriolidæ* was altogether wrong.

The *Campophagidæ* in their osteology prove to have little or no affinity with the *Laniidæ*, but must be placed near the *Muscicapidæ*.

The *Dicruridæ*, judging from their skulls, are also not Shrikes, but aberrant Flycatchers. From their style of nest, they may be allied to the Orioles, and their proper position can only be ascertained by a careful comparison of the osteological characters of the *Oriolidæ* and *Dicruridæ* carried out by some competent anatomist.

In concluding this Address, therefore, I proceed to submit my scheme of the linear arrangement of the Class "Aves," in accordance with the views propounded in the preceding pages; and that this arrangement can be tested by the recent classifications of Fürbringer and Seeböhm, I have given a second Map (Plate XII.) of my arrangement of Birds with the limits of Fürbringer coloured in *blue*, and Seeböhm's in *red*.

The few diagnostic characters given below of the groups and families are nearly all borrowed from the works of other writers, notably those of Seeböhm and Stejneger, whose synopses of characters are useful as summarizing much of the work of their predecessors. The diagnoses are, of course, not by any means exhaustive, and merely are intended to detail some of the leading features of the principal divisions.

## Class AVES.

### Subclass I. **SAURURÆ.**

Order I. ARCHÆOPTERYGES. (Fossil.)

### Subclass II. **RATITÆ.**

Order II. RHEIFORMES. (Neotropical.)

Order III. STRUTHIONIFORMES. (Ethiopian.)

Order IV. CASUARIIFORMES. (Australasian.)

Suborder i. **Dromeæ.**

Suborder ii. **Casuarii.**

Order V. APTERYGIFORMES. (Australasian.)

Suborder iii. **Apteryges.**

Subclass III. **CARINATÆ**.\*

## Order VI. CRYPTURIFORMES †.

Suborder iv. **Tinami**. (Neotropical.)

## Order VII. GALLIFORMES ‡.

Suborder v. **Megapodii** §. (Australasian and Indo-Malayan.)Suborder vi. **Craces** ||. (Neotropical.)Suborder vii. **Phasiani** ¶.Fam. 1. **PHASIANIDÆ**. (Palæarctic and Indian.)2. **TETRAONIDÆ**. (Palæarctic and Nearctic.)3. **PERDICIDÆ**. (Cosmopolitan.)4. **NUMIDIDÆ**. (Ethiopian.)5. **MELEAGRIDÆ**. (Nearctic and Neotropical.)

\* *Euriphiduræ*, Gill et auct. recent., a name drawing attention to the shape of the tail in contrast to that of *Archæopteryx*.

† Cf. Parker, Tr. Z. S. v. pt. 3, pp. 149–241. The order containing the Tinamous consists of a number of Partridge-like birds peculiar to the Neotropical Region. They are Game-birds with a Struthionine palate and pelvis, but have a well-developed keel to the sternum, which “has a narrow median xiphoid process to support the keel, and on each side a still narrower xiphoid process, the three processes occupying four-fifths of its entire length.” The cartilage which connects the ilium with the ischium behind the acetabulum is not ossified. The vomer coalesces with the maxillo-palatines in front, and with the pterygoids and palatines behind. *Pterylosis Galline*, and not in the least Struthionine, the feather-tracts being well differentiated from the bare tracts both on the upper and under parts. [Cf. Seeböhm, *Classif. B.* p. 43.]

An excellent summary of the characters of the Crypturi is also given by Stejneger (*Stand. Nat. Hist.*, Birds, p. 52). Nest “a mere scrape, insufficiently lined with a few grass-leaves” (Hudson, in *Argent. Orn.* ii. p. 210). Note of *Rhynchotus rufescens* a “mellow flute-like sound, so expressive that it is, perhaps, the sweetest bird-music heard on the pampas” (Hudson, *l. c.*). Eggs brown, greenish, purple, or blue, with a peculiar gloss; but the minute structure of the shell, according to Dr. Natusius, is quite different from that of the true *Galli*, and more resembles that of *Apteryx*.

‡ The *Megapodii* and *Craces* are the *Peristeropodes* of Huxley’s celebrated paper on the Classification and Distribution of the *Alectoromorphæ* (P. Z. S. 1868, pp. 294–319). The *Phasiani* are Huxley’s *Alectoropodes*.

§ Episternal process perforated to receive the feet of the coracoids; nasals holothinal; sternum more than twice the length of its inner notch; hallux on the same level as the other toes, and its basal phalanx as long as that of the third toe; oil-gland nude. (Cf. Seeböhm, *l. c.*) Nest *none*. Eggs deposited in a mound raised by many of the birds in concert. Young hatched without the intervention of the parent bird, and able to fly almost from birth.

|| Episternal process perforated to receive the feet of the coracoids; nasals holothinal; inner notch of sternum less than half the length of the whole sternum; hallux on the same level as the other toes, and its basal phalanx as long as that of the third toe; oil-gland tufted. (Cf. Seeböhm, *l. c.*) Nest in a tree. Eggs white, two in number.

¶ The Pheasants, Grouse, and Partridges, with the Turkeys and Guinea-fowl, make up the limits of the Suborder, as far as we know at present. They nest on the

Suborder viii. **Hemipodii** \*. (Sub-temperate and Tropical portions of the Old World.)

Fam. **TURNICIDÆ**.

Suborder ix. **Pterocletes** †. (Sub-tropical portions of the Palæarctic Region, Indian Region, Ethiopian Region.)

Suborder x. **Geophapes** ‡. (Australasian.)

ground and lay a number of eggs, which vary in type of coloration according to the families.

Palate schizognathous; basipterygoid processes articulating with the pterygoids as far from the quadrates as possible; episternal process perforated to receive the feet of the coracoids; nasals holothinal; inner notch of sternum more than half the length of the whole sternum; hallux raised above the level of the front toes, and its basal phalanx shorter than that of the hind toe. (Seeböhm, Classif. B. p. 42.) Oil-gland tufted. Young when hatched covered with patterned down, and able to run in a few hours.

\* *Turnicomorphæ*, Huxley, P. Z. S. 1868, p. 303. Maxillo-palatines not coalesced with each other or with the vomer; nasals schizothinal; dorsal vertebræ heterocelous; sternum with a deep notch on either side of the posterior margin; no powder-down patches; oil-gland tufted; spinal bare tract not reaching to the neck, though the three other tracts do. (Cf. Seeböhm, Classif. B. p. 39.) A well-developed episternum, receiving the feet of the coracoids, but not perforated (W. R. Ogilvie Grant in 'Ibis' for July 1891). Nest none. Eggs numerous, double-spotted. Nestling Galline, covered with down in a pattern.

"Incomplete 'Ægithognathism' occurs in the 'Turnicimorphs' (*Hemipodius* and *Turnix*). Here the vomerine cartilages are very large and completely ossified; and the broad double vomer has a septo-maxillary at each angle; but these bones are only strongly *tied* to the 'ali-nasal' cartilage, and do not graft themselves upon it." (Parker, Tr. Linn. Soc. 2nd ser., Zool. p. 111.)

† *Pteroclomorphæ*, Huxley, P. Z. S. 1868, p. 303. Maxillo-palatines not coalesced with each other or with the vomers; nasals schizothinal; dorsal vertebræ heterocelous; sternum with two notches on each side of the posterior margin of the sternum, (Cf. Seeböhm, Classif. B. p. 39.) For a further summary of characters, cf. Stejneger, Stand. Nat. Hist., Birds, p. 235.

As far as their osteology goes the Sand-Grouse are very Columbine, and had they occurred in a fossil state only they would probably have been placed in the Columbæ (W. R. Ogilvie Grant, in 'Ibis' for July 1891). Oil-gland nude. No powder-down patches; no lateral bare tracts on the neck. Nest none. Eggs three, double-spotted, equally rounded at both ends. Nestling Galline. Young clothed with down like the young of a Partridge, but more variegated with white tufts.

‡ The diagnostic characters of the *Geophapes* are not yet defined; but the sternum presents an aberrant Columbine form very similar to that of a Hemipode (cf. Ogilvie Grant, in 'Ibis' for July 1891). Nest none. Egg white. Young hatched covered with down and able to run soon after birth (cf. Gilbert's note on *G. smithii* in Gould's Handb. B. Austr. ii. p. 134). Gilbert was one of Gould's best collectors and a man of excellent observation.

## Order VIII. COLUMBIFORMES\*. (Cosmopolitan.)

Suborder xi. **Columbæ.**Suborder xii. **Didi.**

## Order IX. OPISTHOCOMIFORMES†. (Neotropical.)

Suborder xiii. **Opisthocomi.**Fam. **OPISTHOCOMIDÆ.**

## Order X. RALLIFORMES ‡. (Cosmopolitan.)

Suborder xiv. **Ralli.**Fam. 1. **GALLINULIDÆ.**2. **RALLIDÆ.**3. **ORTYGOMETRIDÆ.**4. **PODICÆ.**

## Order XI. HELIORNITHIFORMES §. (Neotropical.)

Suborder xv. **Heliorhithes.**Fam. **HELIORNITHIDÆ.**

\* Palate schizognathous; nasals schizorhinal; basipterygoid processes present; basal portion of bill with a fleshy membrane; "sternum narrow, with two notches on either side, the outer one deep, the inner one often reduced to a foramen" (Elliot, Stand. Nat. Hist., Birds, p. 287); other characters are given by Mr. Elliot (*l. c.*). I have not attempted to indicate the Families of the *Columbæ*, as there exists so far no actual classification based on diagnostic characters. Eggs two, white. Nest a slight structure, composed of twigs, generally placed in a tree, though exceptions to this rule are known.

† *Heteromorphae*, Huxley, P. Z. S. 1868, p. 303. Palate schizognathous; nasals holorhinal; dorsal vertebrae heterocoelous; episternal process not perforated to receive the feet of the coracoids; posterior processes of the ilia sufficiently separated to show a broad sacrum; hallux large. (*Cf.* Seeböhm, Classif. B. p. 40.) Oil-gland tufted. Nesting-habits Gallinuline (*cf.* Quelch, Ibis, 1890, p. 327). Eggs three, whitish, with scattered reddish-brown blotches, more closely placed at the obtuse end. Young hatched naked. Pollex and index digit provided with a claw, with which the bird can climb (*cf.* Quelch, *l. c.*, also *cf.* Bingham, as quoted by Stejneger, Stand. Nat. Hist., Birds, p. 197; and for the Myology of *O. cristatus*, J. Beswick Perrin, Trans. Z. S. ix. p. 353 *et seq.*).

‡ Palate schizognathous; nasals holorhinal; dorsal vertebrae heterocoelous; episternal process not perforated to receive the feet of the coracoids; posterior process of the ilium sufficiently perforated to show a broad sacrum; sternum with one notch on each side of the posterior margin. (*Cf.* Seeböhm, Classif. B. p. 40.) Long lateral bare tracts on the neck; oil-gland tufted. Young hatched covered with down, and able to run or swim in a few hours.

§ Palate schizognathous; nasals holorhinal; dorsal vertebrae heterocoelous; episternal process not perforated to receive the feet of the coracoids; posterior process of the ilia separated sufficiently to show a broad sacrum; sternum with one notch on each side of the posterior margin. (*Cf.* Seeböhm, Classif. B. p. 40.) Young, two, hatched naked (*cf.* Neuwied, Beitr. Orn. Bras. iv. p. 827). This last character suggests an affinity with *Opisthocomus*.

## Order XII. PODICIPEDIFORMES\*. (Cosmopolitan.)

Suborder xvi. **Podicipedides.**

## Fam. PODICIPEDIDÆ.

## Order XIII. COLYMBIFORMES†. (Arctic and Sub-Arctic.)

Suborder xvii. **Colymbi.**

## Fam. COLYMBIDÆ.

## Order XIV. SPHENISCIFORMES‡.

Suborder xviii. **Impennes.**

## Fam. APTENODYTIIDÆ.

## Order XV. PROCELLARIIFORMES§. (Cosmopolitan: Pelagic.)

Suborder xix. **Tubinares.**

## Fam. 1. DIOMEDEIDÆ.

## 2. PROCELLARIIDÆ.

## 3. PELECANOIDÆ.

\* Cnemial process of tibia produced forwards to a remarkable degree; posterior process of the ilium approximated to such an extent that the sacrum is almost entirely concealed; palate schizognathous; cervical vertebrae 17 to 21 in number; ankylosed sacral vertebrae preceded by a free vertebra, in front of which are four ankylosed dorsal vertebrae; median xiphoid process of sternum abruptly truncated, so that the lateral processes extend behind it. (Cf. Seeböhm, Classif. B. p. 41.) Spinal feather-tract not defined on neck; ambiens and femoro-caudal muscles absent. For other characters cf. Stejneger, S. N. H. p. 66. Toes lobate; rectrices obsolete. Nest, a mass of stalks and rubbish floating on the water. Eggs white. Young covered with down when hatched, and able to swim at once. Plumage of nestlings striped.

† Cnemial process and posterior processes of the ilium as in the *Podicipedides*; no ankylosed vertebrae in front of the ankylosed sacral vertebrae; median xiphoid process of sternum projecting behind the lateral processes; number of cervical vertebrae 14 or 15. (Seeböhm, Classif. B. p. 41.) Ambiens and femoro-caudal muscles present. Toes four; legs placed far back. Nest in freshwater lakes. Eggs two, dark olive-brown. Young hatched covered with down.

‡ Palate schizognathous; first digit of manus fused with the second in the adult; scapula very broad, not differing very much in size from the keel of the sternum; three metatarsal bones of tarsus very short and separated from each other throughout by deep grooves; bones of forearm all flattened. (Seeböhm, t. c. p. 35.) Spinal feather-tract not defined on nape; none of the wing-feathers differentiated in quills. For numerous other characters see Watson's 'Challenger' Report, and Stejneger, S. N. H. p. 56. Nest a rude structure of grass in the open or in a burrow. Eggs two, white or greenish white. Young when hatched thickly covered with down.

§ External nostrils produced into tubes; nasals holorhinal; dorsal vertebrae heterocoelous; basipterygoid processes absent in *Diomedaeidae* and *Procellariidae*, but present in *Pelecanoidae*; hallux absent or reduced to one phalanx, the other toes directed forwards; spinal feather-tract well-defined on neck; oil-gland tufted. (Seeböhm, t. c. p. 34, and Stjener, t. c. p. 84.) Nest none; egg usually concealed in a hole or

## Order XVI. ALCIFORMES\*. (Circumpolar.)

Suborder xx. **Alcæ.**

## Fam. ALCIDÆ.

## Order XVII. LARIFORMES.

Suborder xxi. **Lari** †. (Cosmopolitan.)

## Fam. 1. STERCORARIIDÆ.

## Fam. 2. LARIDÆ.

Subfam. *Larinæ.*Subfam. *Sterninæ.*Subfam. *Rhynchospinæ.*

## Order XVIII. CHARADRIIFORMES. (Cosmopolitan.)

Suborder xxii. **Dromades** ‡. (Ethiopian and Indian.)

## Fam. DROMADIDÆ.

Suborder xxiii. **Chionides** §. (Antarctic.)

## Fam. CHIONIDIDÆ.

Suborder xxiv. **Attagides** ||. (Neotropical.)

## Fam. 1. ATTAGIDÆ.

## 2. THINOCORIDÆ.

under a boulder; with the Albatrosses, however, the nest is open, and composed of mud and grass. Young, when hatched, covered with down, and unable to provide for themselves for a long period.

\* Palate schizognathous; basipterygoid processes absent; nasals schizorhinal; lateral occipital fontanelles present; feet webbed; spinal feather-tract forked on the upper back; toes three. Egg single, white when in a burrow, otherwise of varied and beautiful colour and markings when laid on a rock. Young, when hatched, covered with down, and unable to provide for themselves for a long period. (*Cf.* Seeböhm, *t. c.* p. 37.) A double moult in the year (*cf.* Stejneger, *t. c.* p. 69).

† Palate schizognathous; nasals schizorhinal; basipterygoid processes absent; spinal feather-tract forked on the upper back; feet webbed. (*Cf.* Seeböhm, *t. c.* p. 37, and Stejneger, *t. c.* p. 74.) Nest none, or a scanty structure of grass; eggs double-spotted. Young, when hatched, covered with down, and fed for some days by the parents.

‡ Palate schizognathous; nasals schizorhinal; no occipital foramina; no basipterygoid processes. Nest none, the single white egg placed at the end of a long burrow.

§ Palate schizognathous; nasals schizorhinal; basipterygoid processes absent; no occipital foramina; spinal feather-tract forked on the upper back. (Seeböhm, *t. c.* p. 37.) For other characters see Stejneger, *t. c.* p. 92. Nest in holes or behind rocks. Eggs somewhat like those of *Hæmatopus*, but thickly blotched with purple. Nestling covered with greyish down.

|| Palate schizognathous; nasals holorrhinal; basipterygoid processes absent; special feather-tract forked on the upper back. (Seeböhm, *t. c.* p. 37.) The vomer broad and anteriorly rounded. Habits Quail-like, but with the flight of a Plover. Eggs

Suborder xxv. **Charadrii** \*. (Cosmopolitan.)

Fam. 1. **HÆMATOPODIDÆ.**  
 2. **CHARADRIIDÆ.**  
 3. **SCOLOPACIDÆ.**

Suborder xxvi. **Glareolæ** †. (Ethiopian; Mediterraneano-Persic; Indian; Australian.)

Suborder xxvii. **Cursorii** ‡. (Ethiopian; Mediterraneano-Persic; Indian.)

Suborder xxviii. **Parræ** §. (Neotropical; Ethiopian; Indian; Australian.)

Suborder xxix. **Ædicnemii** ||. (Nearly Cosmopolitan.)

Suborder xxx. **Otides** ¶. (Temperate and Tropical portions of the Old World.)

pale stone-colour, very thickly speckled with light and dark brown; nest a slight depression in the ground, sometimes lined with a few blades of grass (Durnford, *Ibis*, 1878, p. 403).

\* Palate schizognathous; dorsal vertebrae opisthocelous; basipterygoid processes present; spinal feather-tract forked on upper back. (*Cf.* Seeböhm, *t. c.* p. 38, and Stejneger, *t. c.* p. 98.) Eggs generally four, pyriform, double-spotted. Nest none, or a scanty one of grass.

† Palate schizognathous; nasals schizorhinal; no basipterygoid processes (*cf.* Seeböhm, *t. c.* p. 38); no occipital foramina; wings very long; tarsi short. Nest a slight hollow on bare or sandy ground. Egg thickly mottled, resembling that of a Courser (*Cursorius*).

‡ Palate schizognathous; nasals schizorhinal; basipterygoid processes absent; spinal feather-tract forked on the upper back (Seeböhm, *t. c.* p. 37); tarsi long. Nest a slight hollow scraped in the ground. Egg double-spotted and thickly mottled. Nestling densely clothed in pale down with very little darker pattern.

§ Palate schizognathous; dorsal vertebrae opisthocelous; basipterygoid processes present; no occipital foramina; spinal feather-tract forked on the back. (Seeböhm, *t. c.* p. 38; Stejneger, *Stand. Nat. Hist.* p. 103.) Skeleton like that of a Plover. General aspect that of a Rail. Nest a floating mass of grass and weeds. Eggs pear-shaped and very glossy; uniform olive-brown in *Hydrophasianus*, and extensively scrawled all over with black writings in the other species.

|| Palate schizognathous, but nasals holorrhinal; no basipterygoid process; spinal feather-tract not forked on the upper back; feet not webbed; hind toe absent. (*Cf.* Seeböhm, *t. c.* p. 37.) Nest none. Eggs two, stone-colour with black markings, closely resembling the surrounding stones in the open where the eggs are laid. Young, when hatched, covered with very close-set down, pale sandy with longitudinal black streaks.

¶ Palate schizognathous; nasals holorrhinal; dorsal vertebrae heterocelous; episternal process not perforated to receive the feet of the coracoids; posterior process of the ilia separated sufficiently to show a broad sacrum; sternum with two notches on each side of the posterior margin; oil-gland absent; no lateral bare tracts on the neck; hallux absent. (*Cf.* Seeböhm, *t. c.* p. 40.) Nest a slight depression under tuft of grass, with or without lining. Eggs double-spotted, olive, with obsolete brown shading. Young hatched covered with light down, but tolerably well mottled with black.

## Order XIX. GRUIFORMES.

Suborder xxxi. **Grues**\*. (Nearly Cosmopolitan, but absent in Neotropical Region.)

Suborder xxxii. **Arami**†. (Neotropical.)

Suborder xxxiii. **Rhinochetides**‡. (Confined to New Caledonia.)

Suborder xxxiv. **Mesitides**§. (Confined to Madagascar.)

Suborder xxxv. **Eurypygæ**||. (Neotropical.)

Suborder xxxvi. **Psophiæ**¶. (Neotropical.)

Suborder xxxvii. **Dicholophi**\*\*. (Neotropical.)

\* Maxillo-palatines not coalesced with each other or with the vomer; nasals schizorhinal; dorsal vertebrae heterocelous; no notches on posterior margin of sternum; no powder-down patches; four bare tracts on the body extending for some distance up the neck; oil-gland tufted. (*Cf.* Seeböhm, *t. c.* p. 39.) For convolutions of trachea in some species, *cf.* Stejneger, *t. c.* p. 123. Nest on the ground or in shallow water. Eggs double-spotted, light, with reddish-brown spots. Young, when hatched, covered with light down and soon able to run.

† Maxillo-palatines not coalesced with each other or with the vomer; nasals schizorhinal; dorsal vertebrae heterocelous; sternum with no posterior notches; no powder-down patches; oil-gland tufted; four bare tracts on the body, extending some way up the neck. (*Cf.* Seeböhm, *t. c.* p. 39.) (*Cf.* also Stejneger, *t. c.* p. 127.) Nest among rushes in a marsh. Eggs ten or twelve; "large as a Turkey's, slightly elliptical, sparsely marked with blotches of pale brown and purple on a dull white ground, the whole egg having a powdered or floury appearance" (Hudson, in Argent. Orn. ii. p. 160).

‡ Maxillo-palatines not coalesced with each other or with the vomer; nasals schizorhinal; dorsal vertebrae heterocelous; sternum with no posterior notch; oil-gland nude; a powder-down patch on each side of the rump; four bare body-tracts extending some way up the neck. (*Cf.* Seeböhm, *t. c.* p. 39.) (*Cf.* also Stejneger, *t. c.* p. 118.) Nesting-habits and egg unknown.

§ Maxillo-palatines not coalesced with each other or with the vomer; nasals schizorhinal; dorsal vertebrae heterocelous; sternum with a deep notch on each side of the posterior margin; oil-gland nude; five pairs of powder-down patches on different parts of the body; four bare tracts on the body, extending for some distance up the neck. (*Cf.* Seeböhm, *t. c.* p. 39.) Nests and eggs not authentically known.

|| Maxillo-palatines not coalesced with each other or with the vomer; nasals schizorhinal; dorsal vertebrae heterocelous; sternum with a notch on each side of the posterior margin; oil-gland nude; powder-down patches present; none of the bare tracts of the body extending beyond the base of the neck. (*Cf.* Seeböhm, *t. c.* p. 39.) (*Cf.* also Stejneger, *t. c.* p. 116.) Egg like that of a Woodcock. Nestling Plover-like and covered with down. Young birds fed by parents for some weeks after they are hatched.

¶ Palate schizognathous; nasals holorrhinal; dorsal vertebrae heterocelous; episternal process not perforated to receive the feet of the coracoids; posterior processes of the ilia separated sufficiently to show a broad sacrum; sternum with no notch on the posterior margin; long lateral bare tracts on sides of neck. (*Cf.* Seeböhm, *t. c.* p. 40, and Stejneger, *t. c.* p. 123.) Nest on the ground.

\*\* Palate schizognathous; nasals holorrhinal; dorsal vertebrae heterocelous; episternal process not perforated to receive the feet of the coracoids; posterior process

## Order XX. PELARGIFORMES.

Suborder xxxviii. **Ardeæ** \*. (Cosmopolitan.)

Suborder xxxix. **Ciconiæ** †. (Nearly Cosmopolitan.)

Suborder xl. **Balaenicipetides** ‡. (Ethiopian.)

Suborder xli. **Scopi** §. (Ethiopian.)

Suborder xlii. **Plataleæ** ||. (Cosmopolitan.)

Fam. 1. **PLATALEIDÆ.**

Fam. 2. **IBIDIDÆ.**

of the ilia separated sufficiently to show a broad sacrum; sternum with one notch on each side of the posterior margin; no lateral bare tracts on neck; oil-gland nude. (*Cf.* Seeböhm, *t. c.* p. 40, and Stejneger, *t. c.* p. 120.)

\* Palate desmognathous; mandible not produced and recurved behind its articulation with the quadrate; interclavicle projecting conspicuously within the angle of the furcula; basipterygoid processes absent; spinal bare tract reaching far up to the neck; a large powder-down patch on each side of the rump; no lateral bare tracts on neck. (*Cf.* Seeböhm, *t. c.* p. 27.) Eggs generally blue. Nest roughly constructed, and generally placed in a tree. Young when hatched covered with hair-like down; fed in the nest for a long time by their parents.

† Palate desmognathous; mandible not produced and recurved behind its articulation with the quadrate; basipterygoid processes absent; no interclavicular process within the angle of the furcula; front plantar not leading to the hallux; no lateral bare tracts on the neck; no powder-down patches. Eggs white. Young, when hatched, not covered with down, and requiring to be fed for some time by the parent birds.

‡ Palate desmognathous; spinal bare tract reaching far up the neck; mandible not produced behind its articulation with the quadrate; basipterygoid processes absent; a pair of powder-down patches (*cf.* Seeböhm, *t. c.* p. 27); culmen grooved; toes without basal membrane. For other characters of skeleton, *cf.* Stejneger, *t. c.* p. 172. Nest in reeds or high grass near the water's edge. Egg chalky white, with slight markings. Young, when hatched, helpless and fed by parent birds for some time.

§ Palate desmognathous; mandible not produced and recurved behind its articulation with the quadrate; basipterygoid processes absent; no interclavicular process within the angle of the furcula; front plantar not leading to the hallux; bare tracts on the neck well defined; no powder-down patches. (*Cf.* Seeböhm, *t. c.* p. 27.) For a comparison of characters, myological &c., between *Scopus* and the Storks and Herons, *cf.* Stejneger, *t. c.* p. 170. Nest a structure of great bulk, with chambers inside, built of branches and twigs, and five or six feet in diameter, capable of bearing the weight of a man. Eggs white. Nestling unknown.

|| Palate desmognathous; nasals schizorhinal; basipterygoid processes absent; spinal feather-tract not defined on the back (*cf.* Seeböhm, *t. c.* p. 28). Posterior angle of mandible recurved; occipital foramina present; edge of cranium above orbits truncate, indicating the position of the nasal glands; sternum with four posterior notches; accessory femoro-caudal muscle present (*cf.* Stejneger, *t. c.* p. 158). Nest on a tree or among reed-beds. Eggs greenish white in *Platalea* with spots, in *Ibis* green.

Order XXI. PHENICOPTERIFORMES \*. (Temperate and Tropical portions of both hemispheres.)

Suborder xlii. **Phoenicopterii.**

Order XXII. ANSERIFORMES. (Cosmopolitan.)

Suborder xliv. **Anseres** †.

Fam. 1. CNEMIORNITHIDÆ.

Fam. 2. ANSERANATIDÆ.

Fam. 3. PLECTROPTERIDÆ.

Fam. 4. ANATIDÆ.

Subfam. *Anserinæ*.

Subfam. *Cygninæ*.

Subfam. *Anatinæ*.

Subfam. *Merginæ*.

Suborder xlv. **Palamedeæ** ‡. (Neotropical.)

Fam. ANHIMIDÆ.

Order XXIII. PELECANIFORMES. (Cosmopolitan.)

Suborder xlvi. **Phaethontes** §.

Fam. PHAETHONTIDÆ.

\* Palate desmognathous; basipterygoid processes absent or very rudimentary; nasals holochinal; mandible much produced and recurved behind its articulation with the quadrate (cf. Seeböhm, *t. c.* p. 30). Lachrymo-nasal region elongated; frontalia narrow, not covering the orbits above; grooves for orbital glands present; cæca well developed; bill with lamellæ like a Duck (cf. Stejneger, *t. c.* p. 153). Nest built of mud, exposed, in a lake. Egg one, white. Young covered with whitish down and able to run soon after being hatched.

† Basipterygoid processes on the rostrum of the basisphenoid which articulate with the pterygoids as near the palatines as possible; maxillo-palatines completely coalesced across the middle line; mandible produced and recurved behind its articulation with the quadrate; sternum with only one shallow notch on the posterior margin; oil-gland tufted. (Cf. Seeböhm, *t. c.* p. 31.) Toes webbed; bill lanceolate. Nest of rough construction, variously situated. Eggs numerous, creamy buff or greenish white or pure white. Young covered with down when hatched, and able to run or swim at once.

‡ Palate desmognathous; no uncinate processes to the ribs; cervical vertebræ more than 18; plumage of upper parts with no spinal bare tract. (Cf. Seeböhm, *t. c.* p. 32.) For a comprehensive description of myological and other anatomical characters, cf. Stejneger, *t. c.* p. 133. Nest of rushes of slight construction, the foundation in the water. Eggs six, white. Young covered with yellow down, and able to provide for themselves in a few days (cf. Gibson, *Ibis*, 1880, p. 165).

§ Palate desmognathous; mandible not produced and recurved behind its articulation with the quadrate; no basipterygoid processes; nasal apertures large; palatines not coalesced; sternum not perforated to receive the feet of the coracoids; plumage of neck continuous; no bare tracts; hallux united to second digit by a web; front plantar not leading to hallux. (Cf. Seeböhm, *t. c.* p. 26.) An excellent review of myological and other characters is given by Stejneger, *t. c.* p. 181. Nest none. Egg one only, mottled, reddish brown. Young hatched covered with down, and fed by the parent birds for some time.

Suborder xlvii. **Sulæ** \*.Fam. **SULIDÆ.**Suborder xlviii. **Phalacrocoraces** †.Fam. 1. **PHALACROCORACIDÆ.**Fam. 2. **PLOTIDÆ.**Suborder xlix. **Pelecani** ‡.Fam. **PELECANIDÆ.**Suborder l. **Fregati** §.Fam. **FREGATIDÆ.** (Temperate and Tropical Seas of both Hemispheres.)

\* Palate desmognathous; mandible not produced and recurved behind its articulation with the quadrate; no basipterygoid processes; sternum not perforated to receive the feet of the coracoids; clavicle not ankylosed to sternum; carotid arches on cervical vertebrae; dorsal vertebrae without ventral processes; plumage of neck continuous; no bare tracts; hallux united to the second digit by a web; front plantar not leading to hallux. (Seebohm, *t. c.* p. 26.) On the proportions of the toes and other characters *cf.* Stejneger, *t. c.* p. 188. Nest a rough structure of grass or seaweed. Egg, one only, white with a chalky texture. Young, when hatched, fed by the old birds for a long time.

† Palate desmognathous; mandible not produced and recurved behind its articulation with the quadrate; no basipterygoid processes; sternum not perforated to receive the feet of the coracoids; dorsal vertebrae opisthocœlous, with ventral processes; plumage of neck continuous; no bare tracts; hallux united to the second digit by a web; front plantar not leading to hallux. (Seebohm, *t. c.* p. 26.) Bill hooked at the end of the culmen; tail-feathers stiffened. For other characters, *cf.* Stejneger, *t. c.* p. 190. For those of the Plotidæ, see Garrod, *P. Z. S.* 1876, p. 335 *et seq.* Eggs four, white or light blue with a chalky texture. Nest generally a huge pile of seaweed; on a rock or in a tree. Young, when hatched, naked.

‡ Palate desmognathous; mandible not produced and recurved behind its articulation with the quadrate; no basipterygoid processes; sternum not perforated to receive the feet of the coracoids; clavicle ankylosed to sternum; dorsal vertebrae heterocœlous; plumage of neck continuous; no bare tracts; hallux united to second digit by a web; front plantar not leading to hallux. (*Cf.* Seebohm, *t. c.* p. 26.) Tail-feathers 24, and soft. (*Cf.* also Stejneger, *t. c.* p. 185, for other characters.) Nest in trees or on the ground. Egg, one only, white with a chalky texture. Young hatched naked, and fed by the old birds for some time. (See also Mivart on the Axial Skeleton of the Pelecanidæ, *Trans. Z. S.* x. p. 315 *et seq.*)

§ Palate desmognathous; mandible not produced and recurved behind its articulation with the quadrate; no basipterygoid processes; sternum not perforated to receive the feet of the coracoids; clavicle ankylosed to sternum; no complete carotid arches on cervical vertebrae; plumage of neck continuous; no bare tracts; hallux united to second digit by a web; front plantar not leading to hallux. (*Cf.* Seebohm *t. c.* p. 26.) Tarsus feathered, as also the toes; tarsus abnormally short, &c. (*cf.* Stejneger, *t. c.* p. 183). Nesting generally in rookeries; the nest on rocks or trees. Egg, one only, white, much smoother than those of *Sula*. Young, when hatched, helpless, and requiring to be fed by the parents for many days.

## Order XXIV. CATHARTIDIFORMES \*. (Neogæan.)

Suborder li. **Pseudogryphi.**

## Fam. CATHARTIDÆ.

## Order XXV. ACCIPITRIFORMES.

Suborder iii. **Serpentarii** †. (Ethiopian.)Suborder liii. **Accipitres** †. (Cosmopolitan.)

Fam. 1. VULTURIDÆ. (Mediterraneo-Persic ; Ethiopian ; Indian.)

Fam. 2. FALCONIDÆ.

Subfam. *Polyborinæ.*

Subfam. *Accipitrinæ.*

Subfam. *Buteoninæ.*

Subfam. *Aquilinæ.*

Subfam. *Falconinæ.*

\* Palate desmognathous ; nostrils perforated ; the maxillo-palatines wide apart, and though the distance is bridged over by an ossified nasal septum, the ossification does not prevent the nostrils being pierced ; basipterygoid processes present ; hallux connected with the *flexor perforans digitorum*, small and elevated above the level of the other toes. *Pseudogryphi* of Forbes, *Mimogypes* of Seeböhm. Spinal feather-tract not defined on neck ; semitendinosus and accessory semitendinosus muscles are present ; oil-gland nude ; cæca none. (Seeböhm, *t. c. p. 23.*) Nest on the ground, or in hollow of stump (*Rhinogryphus*), or at the side of a precipice (*Sarcorhamphus*). Eggs two, white with spots (*Rhinogryphus*), or entirely white (*Sarcorhamphus*). Young, when hatched, naked (*Sarcorhamphus*) or covered with down (*Rhinogryphus* and *Cathartes*).

† Palate desmognathous ; basipterygoid processes present ; femoro-caudal muscle absent ; accessory femoro-caudal present ; semitendinosus and accessory semitendinosus muscles present ; deep plantar tendons Galline ; hallux present, connected with the *flexor longus hallucis*, and not with the *flexor perforans digitorum* ; spinal feather-tract well defined on the neck ; oil-gland tufted. (Seeböhm, *t. c. p. 15.*) Head crested and ornamented with pendent occipital plumes ; centre tail-feathers produced ; toes connected by a membrane. Habits terrestrial. Nest placed on a tree. Eggs two, white with light brown dots at the obtuse end. Nestling undescribed.

‡ Palate desmognathous<sup>1</sup> ; basipterygoid process absent ; dorsal vertebræ heterocoelous ; hallux present, connected with the *flexor longus hallucis*, and not with the *flexor perforans digitorum* ; the two tendons bound together by a fibrous vinculum ; spinal feather-tract well defined on the neck. (Cf. Seeböhm, *t. c. p. 16.*) A cere always present ; outer toe not reversible ; eyes placed laterally in the head. Female generally larger than the male (cf. Sharpe, *Cat. B. i. p. 1.*) Nest in various positions, on a tree, or on the ground, often on the side of a precipice. Egg varying in colour. Young hatched helpless and covered with down ; fed in nest by parent birds for a considerable time.

<sup>1</sup> Dr. Shufeldt has recently shown that *Elanus* has a non-desmognathous palate [*Ibis*, 1891, p. 230].

Suborder liv. **Pandiones** \*. (Nearly Cosmopolitan.)

Suborder lv. **Striges** †. (Cosmopolitan.)

Fam. 1. BUBONIDÆ.

Fam. 2. STRIGIDÆ.

Order XXVI. CORACIFORMES.

Suborder lvi. **Steatornithes** ‡. (Neotropical.)

Suborder lvii. **Podargi** §. (Australasian.)

Suborder lviii. **Leptosomati** ||. (Lemurian.)

\* Differ from the Accipitres in having the outer toe reversible, and the proportions of the tibia and tarsi are Owl-like; no after-shaft to the contour-feathers. Nest a huge structure on rocks or buildings, or on a tree. Egg very richly coloured. Young hatched covered with down.

† Palate desmognathous; basipterygoid processes present; *flexor longus hallucis* leading to hallux, *flexor perforans digitorum* to second, third, and fourth digits; spinal feather-tract well defined on the neck; oil-gland present, but nude. (Cf. Seeböhm, *t. c.* p. 17.) Outer toe reversible; eyes directed forwards and encircled by a facial disk; no after-shaft to the contour-feathers. (Sharpe, Cat. B. ii. p. 1; Barrows, S. N. Hist. pp. 321-343.) Nest generally in hole of a tree or wall. Eggs white. Young, when hatched, covered with down, and fed for a long time by the parent birds.

‡ Palate desmognathous, the palatines meeting across the median line, each being folded upon itself behind the junction, the lateral posterior processes absent; basipterygoid processes present; dorsal vertebrae opisthoceolous; sternum with two notches on the posterior margin; hallux present, and connected with the *flexor perforans digitorum*; spinal feather-tract well defined on the neck, but forked on the upper back; oil-gland not tufted; tail-feathers ten. (Cf. Parker, P. Z. S. 1889, p. 161; also cf. Seeböhm, *t. c.* p. 21, and Stejneger, S. N. Hist. pp. 371, 385.) Nest in a cave, a hard block shaped like a cheese. Eggs four, white. Nestling unknown.

§ Palate desmognathous; basipterygoid processes absent; hallux present, and connected with the *flexor perforans digitorum*; spinal feather-tract well-defined on the neck, but forked on the upper back; oil-gland *none*; a powder-down patch on each side of the rump. (Cf. Seeböhm, *t. c.* p. 21; cf. also Stejneger, *t. c.* p. 385.) A flat nest of sticks on the fork of a branch. Eggs two, white.

|| Hallux connected with the *flexor perforans digitorum*, and not with the *flexor longus hallucis*; palate desmognathous; vomer externally attenuated; basipterygoid processes rudimentary; sternum with four notches on posterior margin, and having a pointed episternal apophysis; spinal feather-tract well defined on the neck by lateral bare tracts, but dividing into two tracts on the upper back; oil-gland nude; ambiens muscle absent; tail-feathers 12; feet semi-zygodactyle; a powder-down patch on each side of the rump; nasal apertures exposed and linear, situated in the middle of the upper mandible, a horny plate across the nasal opening instead of a membrane. Nest, in a hole, of rushes. Egg white (Milne-Edw. and Grand. Hist. Nat. Madag., Ois. p. 227). Young, judging from the figure in Grandidier and Milne-Edwards's plate 84, very Centropodine in appearance.

Suborder lix. **Coraciæ** \*. (Palæogæan.)

Suborder ix. **Halcyones** †. (Cosmopolitan.)

Suborder lxi. **Bucerotes** ‡. (Ethiopian; Indian; Austro-Malayan.)

Suborder lxii. **Upupæ** §. (Palæarctic; Indian; Ethiopian.)

Suborder lxiii. **Meropæ** ||. (Palæogæan.)

\* Feet anisodactyle; no powder-down patches; nostrils placed near the base of the upper mandible and hidden by bristles. Hallux connected with the *flexor perforans digitorum*, and not with the *flexor longus hallucis*; palate desmognathous; vomer externally attenuated; basipterygoid processes rudimentary; sternum with four notches on posterior margin, and having a pointed episternal apophysis; spinal feather-tract well defined on the neck by lateral bare tracts, but dividing into two tracts on the upper back; oil-gland nude; ambiens muscle absent; tail-feathers 12. Young hatched helpless. Nest in hole of tree. Egg white.

† Palate desmognathous; basipterygoid processes absent; cæca none; accessory semitendinosus muscle absent; feet syndactyle; hallux connected with the *flexor perforans digitorum*; no aftershaft to the contour-feathers; spinal feather-tract well defined on neck, and not forked on the back; ventral feather-tract not only split in the centre but also on each side of the breast by bare tracts; oil-gland tufted; feet anisodactyle; tail-feathers 12 (except in *Tanysiptera*, 10). Nest, a rough construction of fish-bones, or none, situated in a hole. Eggs white. Young hatched naked and helpless.

‡ Palate desmognathous; basipterygoid processes present; episternal process perforated to receive the feet of the coracoids; sternum with two posterior notches; hallux present, and connected with the *flexor perforans digitorum* instead of the *flexor longus hallucis*; tail-feathers 10; carotids one, or two (in *Buceros*, none); spinal feather-tract not defined on the neck, which has no lateral bare tracts either; no aftershaft to the feathers; cæca none; bill with a casque, more or less developed, generally cellular, sometimes solid (*Rhinoplax*). Nest none. Female enclosed in hole of tree during incubation and fed by male. Egg white. Young hatched perfectly naked and fed by the male, who brings food in a fig-like envelope for the support of the female and single youngster.

§ Palate desmognathous; episternal process perforated to receive the feet of the coracoids; manubrial process pointed; sternum with two deep notches on the posterior margin; deep plantar tendons free; tarsus with the planta scutellate (Alaudine); left carotid only present; spinal feather-tract forked on the upper back; oil-gland tufted; cæca none. Nest in hole of a tree or wall. Eggs white or whitish. Female almost entirely fed by male during incubation. (Cf. Murie, *Ibis*, 1873, pp. 181-211, pls. vi., vii.)

|| Palate desmognathous; basipterygoid processes absent; episternal process forked (as in most of the Passeres), and perforated to receive the feet of the coracoids; sternum with four notches on its posterior margin; hallux present, and connected with the *flexor perforans digitorum*, and not with the *flexor longus hallucis*; cæca present; spinal feather-tract well defined on the neck, but forked on the upper back; oil-gland nude; tail-feathers 10. Nest none, a hole being tunnelled in a bank by the birds themselves, as with the Kingfishers. Egg white. Young, when hatched, naked, the feathers, when developed, inclosed in a sheath until nearly fullgrown, as with Kingfishers and other *Picariæ*.

Suborder Ixiv. **Momoti** \*. (Neotropical.)

Suborder Ixv. **Todi** †. (Antilles.)

Suborder Ixvi. **Caprimulgi** ‡. (Nearly Cosmopolitan.)

Fam. 1. **NYCTIBIIDÆ**.

Fam. 2. **CAPRIMULGIDÆ**.

Suborder Ixvii. **Cypseli** §. (Cosmopolitan.)

Suborder Ixviii. **Trochili** ||. (Neogæan.)

\* Palate desmognathous; basipterygoid processes absent; sternum with four notches on posterior margin, converted into foramina; two carotid arteries present; spinal feather-tract well defined on neck, and not forked on the upper back; after-shaft of contour-feathers present; cæca absent; hallux always present, and connected with the *flexor perforans digitorum*. Bill serrated. (Cf. Seeböhm, *t. c.* p. 20; Stejneger, *t. c.* p. 395; Murie, *Ibis*, 1872, pp. 383-412, pls. xiii.-xv.)

† Palate desmognathous; basipterygoid processes absent; sternum with four notches on the posterior margin, open, and not converted into foramina as in the *Momoti*; cæca large; ambiens muscle absent; no carotid arteries present; hallux present and connected with the *flexor perforans digitorum*; spinal feather-tract well defined on neck, and not forked on the back; oil-gland with well-developed tufts. Nest none, a hole being tunnelled by the birds themselves. Eggs four, white.

‡ Palate schizognathous, the vomer truncated behind; basipterygoid processes present; semitendinosus muscle present; ambiens muscle absent; hallux present and connected with the *flexor perforans digitorum*; feet anisodactyle; spinal feather-tract well defined on the neck, but forked on the upper back; oil-gland not tufted. Nest none. Eggs white, with scroll-like markings and spots. Young hatched helpless, but covered with down.

§ Palate ægithognathous; basipterygoid processes absent; cæca absent; semitendinosus muscle absent; all four toes directed forwards; hallux present and connected with the *flexor perforans digitorum*; sternum with a high keel and an unnotched posterior margin; spinal feather-tract well defined on the neck, but forked on the upper back; no median coverts (cf. Goodchild, *Proc. R. Phys. Soc. Edinb.* x. p. 331); oil-gland nude. (Cf. also Stejneger, *S. N. Hist.* p. 436.) Form of nest various (differing with the genera)—concealed (*Cypselus*, *Cheatura*), pendent, with a tube (*Panyptila*), cup-shaped, in a cave (*Collocalia*), exposed on a stump (*Dendrochelidon*). Egg white. Young, when hatched, naked.

|| Palate schizognathous<sup>1</sup>; basipterygoid processes absent; nasals holorrhinal; sternum with a deep keel, rounded at the posterior end, without indentations; left carotid present; oil-gland nude; cæca absent; tongue extensile, the hyoid bones curved over the back of the skull as in the Woodpeckers; front plantar leading to three front toes; hind plantar leading to hallux; primaries 10, the secondaries very short; tail-feathers 10; no median coverts. (Cf. Goodchild, *Proc. R. Phys. Soc. Edinb.* x. p. 331.) Nest generally cup-shaped, on a branch, sometimes attached to the side of a rock. Eggs white, oval, two in number.

<sup>1</sup> Professor Stewart, from dissections which he has recently made, considers the palatine arrangement of the *Trochili* to be merely a modification of the ægithognathous type.

Suborder Ixix. **Colii** \*. (Ethiopian.)

Order XXVII. TROGONES †. (Neotropical; Indian; Ethiopian.)

Order XXVIII. COCCYGES.

Suborder lxx. **Musophagi** ‡. (Ethiopian.)Suborder lxxi. **Cuculi** §.

\* Palate desmognathous; basipterygoid processes absent; cæca none; ambiens muscle absent; left carotid only present; sternum with four notches on the posterior margin; feet pamprodactylous (Stejneger, *t. c.* p. 371), all four toes being directed forwards, the first one probably reversible; hallux present, and connected with the *flexor perforans digitorum*; the two plantar tendons blended; tail-feathers 10; spinal feather-tract well defined on neck, and not forked on the back; no bare tracts on the breast; oil-gland tufted. Nest cup-shaped, in a bush. Eggs white. (*Cf.* Murie, *Ibis*, 1872, pp. 262-280, pl. x.)

† Palate schizognathous; basipterygoid processes present; sternum with four indentations on the posterior margin; no median wing-coverts (Goodchild, *t. c.* p. 331); left carotid only present; ambiens muscle absent; feet heterodactylous (*cf.* Stejneger, *t. c.* p. 369); second digit reversed; the front plantar splits into two to lead to the two front toes, and the hind plantar does the same to lead to the two hind toes—*i. e.* the *flexor hallucis* supplies the first and second digits, and the *flexor perforans* the third and fourth (*cf.* Seeböhm, *t. c.* p. 8); spinal feather-tract very Passerine, well-defined from nape to oil-gland, and not forked; aftershaft of contour-feathers very large; cæca present; oil-gland nude. Nest in hole of tree. Eggs white.

‡ Palate desmognathous; basipterygoid processes absent; cæca none; ambiens muscle present; tail-feathers 10; feet zygodactyle (semi-zygodactyle, according to Seeböhm); plantars Galline; hallux always present, and connected with the *flexor longus hallucis*, and not with the *flexor longus digitorum*, which leads to the second, third, and fourth digits; the two tendons united at their crossing point by a vinculum, *i. e.* the arrangement is desmopelous; spinal feather-tract well defined on neck, and not forked on back; oil-gland tufted; contour-feathers with aftershafts. Wing-feathers in many species red, from which Turacin is extracted. (*Cf.* Shelley, *Cat. B.* xix. pp. 435-456.) Nest open, like that of a Pigeon. Egg white. Young unknown.

§ Palate desmognathous; basipterygoid processes absent; cæca present; both carotids present; ambiens muscle present; tail-feathers generally 10, 8 in *Guira* and *Crotophaga*; plantars Galline; hallux always present, and connected with the *flexor longus hallucis*, and not with the *flexor perforans digitorum*, which leads to the second, third, and fourth digits; the two tendons united at their crossing point by a vinculum, this arrangement being desmopelous (*cf.* Stejneger, *S. N. Hist.* p. 373); feet zygodactyle; contour-feathers without aftershaft; oil-gland nude; syrinx varied (bronchial, tracheo-bronchial, or pseudo-bronchial) (*cf.* Stejneger, *t. c.* p. 373). Nest of rough construction. Habits generally parasitic. (Great varieties in nesting-habits.) Egg of various colours, differing according to genera. Young hatched naked: in many instances fed by foster-parents, but in other cases reared by parent birds. (*Cf.* Shelley, *Cat. B.* xix. pp. 209-434.)

## Order XXIX. PSITTACIFORMES\*.

Suborder lxxii. **Psittaci.**

Fam. 1. **NESTORIDÆ.**†  
 2. **LORIIDÆ.**  
 3. **CYCLOPSITTACIDÆ.**  
 4. **CACATUIDÆ.**  
 5. **PSITTACIDÆ.**  
 6. **STRINGOPIDÆ.**

## Order XXX. SCANSORES.

Suborder lxxiii. **Rhamphastides** ‡. (Neotropical.)Suborder lxxiv. **Capitones** §. (Neotropical; Ethiopian; Indian.)Suborder lxxv. **Indicatores** ||. (Ethiopian; Indian.)

\* Palate desmognathous; upper mandible movable, loosely articulated to the skull; a distinct cere at base of bill; dorsal vertebræ opisthocœlous; deep plantar tendons Galline; feet zygodactyle; tail-feathers 10; spinal feather-tract well defined on neck, and forked on upper back; oil-gland tufted or absent. Nest in hole of tree. Egg white. Young, when hatched, naked, the feathers remaining in the sheath until nearly full-grown, after the manner of nestling *Picariae*.

† The following order of Families has been kindly supplied to me by my friend Count Salvadori. He proposes it in his forthcoming volume of the British Museum 'Catalogue of Birds.'

‡ Palate desmognathous; vomer truncated; basipterygoid processes absent; manubrial process pointed; bill very large, but very light, being filled with cellular bony tissue; tongue long and feather-like, the margins being obliquely notched; cæca absent; left carotid only present; tail-feathers 10; feet zygodactyle; *flexor perforans digitorum* as in *Buccones*; wing-coverts Oscinine; caudal muscles peculiar, as also the terminal caudal vertebrae (cf. Stejneger, *t. c.* p. 415); spinal feather-tract well defined on the neck, and forked on the lower (not the upper) back; postscapular feather-tracts separated on lower back and rump. (Cf. Stejneger, *l. c.* p. 415; Sclater, Cat. B. Brit. Mus. xix. pp. 124-160.) Oil-gland tufted. Nest in hole of tree. Egg white.

§ Palate ægithognathous, sometimes desmognathous; vomer single, bifid; basipterygoid processes absent; manubrial process pointed; femoro-caudal and accessory semitendinosus muscles present; ambiens and accessory femoro-caudal absent; cæca none; left carotid only present; tail-feathers 10; feet zygodactyle; *flexor perforans digitorum* leading to third digit only; *flexor longus hallucis* first sending a tendon to the other plantar, then a second to fourth digit, after which it splits into two tendons, one leading to the hallux, the other to the second digit; spinal feather-tract well defined on the neck, and forked on the lower (not on the upper) back; ventral feather-tract forked on the throat and on each side of breast; oil-gland tufted. Nest in hole of tree. Egg white.

|| Palate ægithognathous; vomer bifurcate; basipterygoid processes absent; manubrial process pointed; femoro-caudal and accessory semitendinosus muscles present; ambiens and accessory femoro-caudal absent; cæca absent; left carotid only present; tail-feathers 12 (in *Prodotiscus*<sup>1</sup> 10); feet zygodactyle; *flexor perforans digitorum* as

<sup>1</sup> *Prodotiscus* is probably not a member of this Suborder.

## Order XXXI. PICIFORMES.

Suborder lxxvi. **Pici** \*. (Cosmopolitan, but is absent in Australian Regions.)

Suborder lxxvii. **Buccones** †. (Neotropical.)

Suborder lxxviii. **Galbulæ** ‡. (Neotropical.)

## Order XXXII. EURYLÆMI §. (Indian; Austro-Malayan.)

## Order XXXIII. MENURÆ ||. (Australian.)

described in *Buccones*; spinal feather-tract well defined on the neck, and forked on the lower (not the upper) back; ventral feather-tract forked on throat, but not on each side of breast; oil-gland tufted. (Cf. Shelley, Cat. B. Brit. Mus. xix. pp. 1-12.) Nest in hole of tree; ? parasitic on Barbets and other *Picarie* (cf. Sharpe's ed. Layard's B. S. Afr. p. 168). Egg white.

\* Palate saurognathous; vomer slender, pointed, split; basipterygoid processes absent; manubrial rostrum of sternum bifurcate; caeca none; left carotid only present; feet zygodactyle; *flexor perforans digitorum* as described in the *Indicatores*; tongue extensile, long, worm-like, capable of great protrusion, the hyoid cornua extending backwards over the skull (except in *Sphyrapicus* and *Xenopicus*). Spinal feather-tract well-defined on the neck, and forked on the lower (not the upper) back; oil-gland tufted; femoro-caudal and semitendinosus muscles present; ambiens and accessory femoro-caudal muscle absent; tail-feathers 12. Nest in holes. Eggs white. Young hatched helpless, but soon able to climb. (Cf. Hargitt, Cat. B. Brit. Mus. vol. xviii.)

† Palate desmognathous; vomer present; basipterygoid processes absent; caeca present; both carotids present; ambiens muscle present; tail-feathers 12; feet zygodactyle; *flexor longus digitorum* as described in the *Indicatores*; wing-coverts non-Oscinine (*Sundevall*); spinal feather-tract well defined on the neck, and forked on the lower (not on the upper) back; no clavicular feather-tract; no aftershaft to the contour-feathers; genys rounded; ventral tract without gular branch; oil-gland nude. Nest in holes. Egg white. (Cf. Sclater, Cat. B. Brit. Mus. vol. xix. pp. 178-208.)

‡ Palate desmognathous; basipterygoid processes absent; no vomer; genys rounded; ventral feather-tract without gular branch; caeca present; feet zygodactyle; *flexor perforans digitorum* leading to third digit only; *flexor longus hallucis* first sending a tendon to the other plantar, then a second to fourth digit, after which (if hallux present) splitting into two tendons, one leading to the hallux, the other to the second digit; spinal feather-tract well defined on the neck, and forked on the lower (not on upper) back; a narrow clavicular feather-tract on each side of the breast; a small aftershaft to the contour-feathers; oil-gland nude. Nest in holes of banks or of stumps of trees. Eggs two, white. (Cf. Sclater, Cat. B. Brit. Mus. xix. pp. 161-177.)

§ Palate agithognathous; nasals holorrhinal; dorsal vertebrae heterocoelous; *flexor longus hallucis* leading to hallux after sending down a tendon to the *flexor perforans digitorum*, which leads to the three front digits; oil-gland present, but nude. Nest a bulky purse-like structure, of large size. Egg white, or dull white, thickly speckled with minute spots and specks of rusty brown. (Cf. Sclater, Cat. B. Brit. Mus. xiv. pp. 455-470; Seeböhm, *t. c.* p. 4.)

|| Nestling thickly covered with down. Furcula complete; sternum with a slight indentation near the outer edge of posterior margin; plantar tarsi strongly scutellated; tail-feathers greatly produced, and mostly devoid of hooklets; *tensor patagii brevis* muscle Picarian; intrinsic muscles fastened to the ends of the semi-rings (Acromyotina); plantar tendons free. (Cf. Sharpe, Cat. B. xiii. pp. 661-663.)

## Order XXXIV. PASSERIFORMES \*. (Cosmopolitan.)

## Section A. Oscines.

## Fam. 1. CORVIDÆ †.

(Cf. Sharpe, Cat. B. iii. pp. 1-152.)

## 2. PARADISEIDÆ ‡.

(Cf. Sharpe, Cat. Birds, iii. pp. 153-186.)

## 3. PTILONORHYNCHIDÆ.

(Cf. Sharpe, Cat. B. vi. pp. 380-396.)

## 4. STURNIDÆ §.

(Cf. Sharpe, Cat. B. xiii. pp. 1-92.)

## 5. EULABETIDÆ ||.

(Cf. Sharpe, Cat. B. xiii. pp. 93-157.)

## 6. EURYCYEROTIDÆ.

(Cf. Sharpe, Cat. B. iii. p. 326.)

## 7. DICRURIDÆ ¶.

(Cf. Sharpe, Cat. B. iii. pp. 229-269.)

## 8. ORIOLIDÆ.

(Cf. Sharpe, Cat. B. iii. pp. 188-226.)

## 9. ICTERIDÆ.

(Cf. Sclater, Cat. B. Brit. Mus. xi. pp. 308-405.)

## 10. PLOCEIDÆ.

(Cf. Sharpe, Cat. B. xiii. pp. 198-511.)

## 11. TANAGRIDÆ.

(Cf. Sclater, Cat. B. Brit. Mus. xi. pp. 49-307.)

\* Palate ægithognathous; cervical vertebræ not exceeding 15 in number; ambiens and accessory femoro-caudal muscles absent; deep plantar tendons free; hallux always present, and connected with the *flexor longus hallucis* and not with the *flexor perforans digitorum*; spinal feather-tract well defined on neck; spinal feather-tract not forked on the upper-back; oil-gland present, but nude.

† Dr. Shufeldt thought that the presence of a bony siphonium was peculiar to the *Corvidæ*, but recent dissections made by Professor Stewart prove that this character is found in all the higher Oscines.

‡ The difference in the proportion of the toes, adopted from Sundevall's 'Tentamen' (p. ), to separate the Birds of Paradise from the Crows, will probably be found to break down when carefully examined. Mr. Goodchild's character of the absence of median wing-coverts may be useful in the diagnosis, but the limits of the family are at present badly defined, and it is difficult to draw a line of distinction between some of the Bower-birds and the Birds of Paradise (e. g. *Xanthomelus* and *Amblyornis*), and it is certain that some forms of *Paradiseidæ*, like *Parotia* for instance, have "playing-grounds" like *Tectonornis* and other "Bower" builders.

§ Ambulatorial. Mandible with the angular much prolonged. First primary feebly developed. Eggs uniform, bluish.

§ Arboreal. Eggs spotted. (Cf. Oates, Faun. Brit. Ind., Birds, i. p. 509.)

¶ As before mentioned, a more minute comparison of the osteology of this family is necessary before determining its proper place in the natural system.

## Fam. 12. CÆREBIDÆ.

(Cf. Selater, Cat. B. Brit. Mus. pp. 1-48.)

## 13. FRINGILLIDÆ \*.

(Cf. Sharpe, Cat. B. xii. pp. 1-816.)

## 14. ALAUDIDÆ †.

(Cf. Sharpe, Cat. B. xiii. pp. 512-658.)

## 15. MOTACILLIDÆ ‡.

(Cf. Sharpe, Cat. B. x. pp. 456-629.)

## 16. MNIOTILTIDÆ.

(Cf. Sharpe, Cat. B. x. pp. 225-455.)

## 17. CERTHIIDÆ.

(Cf. Gadow, Cat. B. viii. pp. 322-366.)

## 18. MELIPHAGIDÆ.

(Cf. Gadow, Cat. B. ix. pp. 204-290.)

## 19. NECTARINIIDÆ.

(Cf. Gadow, Cat. B. ix. pp. 1-146.)

## 20. DICÆIDÆ.

(Cf. Sharpe, Cat. B. x. pp. 2-84.)

## 21. ZOSTEROPIDÆ §.

(Cf. Sharpe, Cat. B. ix. pp. 146-203.)

## 22. PARIDÆ ||.

(Cf. Gadow, Cat. B. viii. pp. 1-79.)

## 23. REGULIDÆ.

(Cf. Gadow, Cat. B. viii. pp. 79-87.)

## 24. LANIIDÆ ¶.

(Cf. Gadow, Cat. B. viii. pp. 88-291.)

\* The boundaries between this family and the *Tanagridæ* are very feebly defined at present.

† The Buntings of the family *Fringillidæ* approach the *Alaudidæ* through *Plectrophenax*, which would appear to be somewhat like *Otocorys*. The scutellate planta tarsi separate the *Alaudidæ* from all other Oscines.

‡ In their elongated secondaries and in their nesting-habits the Wagtails and Pipits resemble the *Alaudidæ*. They have, however, a very remarkable Sylviine characteristic in having a spring moult as well as an autumn one. This fact I drew attention to in 1885 (cf. Cat. B. x. p. 460); but it has been proved beyond a doubt this year, when a pair of Tree-Pipits (*Anthus trivialis*), which have lived through the winter in my daughter Dora's aviary, went through a complete moult in March.

§ An examination of the tongue of *Zosterops* shows that it resembles that of a Tit and has no similarity to the "brush" tongue of the Honey-sucker. For the present, therefore, I am inclined to keep the White-eyes as a separate family, though Mr. Oates, in the 'Birds of British India,' places the genus *Zosterops* near *Yuhina*.

|| For *Chamaea*, cf. Sharpe, Cat. B. Brit. Mus. vii. p. 311.

¶ The ossification of the olfactory capsule and the spine-like process on the posterior end of the palatines are characters almost confined to the *Laniidæ* alone. (Cf. Shufeldt, Journ. Morph. iii. p. 99, 1889.) The palate and nasal aperture in the skull of the Wood-Shrikes, which I formerly kept distinct under the heading of *Prionopidæ*, will have to be carefully examined. Some of the genera may have to be located with the Flycatchers.

## Fam. 25. ARTAMIDÆ\*.

(Cf. Sharpe, Cat. B. xiii. pp. 3-21.)

## 26. AMPHIDÆ.

(Cf. Sharpe, Cat. B. x. pp. 211-224.)

## 27. VIREONIDÆ.

(Cf. Gadow, Cat. B. vii. pp. 292-321.)

## 28. SYLVIIDÆ†.

(Cf. Seeböhm, Cat. B. v. pp. 1-145, and Sharpe, Cat. B. vii. pp. 93-310, for *Cisticolæ* and *Bryopterinæ*.)

## 29. TURDIDÆ†.

(Cf. Seeböhm, Cat. B. v. pp. 146-401.)

## 30. CINCLIDÆ.

(Cf. Sharpe, Cat. B. vi. pp. 306-321.)

## 31. TROGLODYTIIDÆ.

(Cf. Sharpe, Cat. B. vi. pp. 180-305.)

## 32. MIMIDÆ‡.

(Cf. Sharpe, Cat. B. vi. pp. 322-367.)

## 33. TIMELIIDÆ§.

(Cf. Sharpe, Cat. B. vii. pp. 312-647.)

## 34. PYCNONOTIDÆ.

(Cf. Sharpe, Cat. B. vi. pp. 1-179.)

## 35. CAMPOPHAGIDÆ.

(Cf. Sharpe, Cat. B. iv. pp. 8-110.)

## 36. MUSCICAPIDÆ.

(Cf. Sharpe, Cat. B. iv. pp. 111-468.)

## 37. HIRUNDINIDÆ.

(Cf. Sharpe, Cat. B. x. pp. 85-210.)

## Section B. Oligomyodæ.

## Fam. 1. TYRANNIDÆ.

(Cf. Sclater, Cat. B. xiv. pp. 1-279.)

## 2. OXYRHAMPHIDÆ.

(Cf. Sclater, Cat. B. xiv. pp. 280-282.)

\* The *Artamidæ* have a Shrike-like ossification of the olfactory capsule, but they have a curious modification of the palate, as has been discovered by Professor Stewart. The vomer is ægithognathous, but the palate is desmognathous.

† For *Pratincola* and *Cryptolopha*, &c., cf. Sharpe, Cat. B. iv. pp. 178 and 393, and for *Copsychus* and allied Turdine forms, cf. Sharpe, Cat. B. vii. pp. 1-92. The Accentors are probably not deserving of separate family rank, and are now merged in the Turdidae. For Accentor, cf. Sharpe, Cat. B. vii. pp. 648-670; and for *Myiadectes*, see Sharpe, Cat. B. vi. p. 368.

‡ The recent researches of Mr. Lucas into the osteology of the Thrushes and Wrens (Proc. U.S. Nat. Mus. xi. pp. 173-180) show that there is good foundation for keeping the *Mimidæ* as a distinct family.

§ I am not prepared at the present moment to reconsider the Timeliidæ, but I would refer students to an excellent attempt to subdivide the family by Mr. Oates in the 'Fauna of British India, Birds,' i. p. 71.

## Fam. 3. PIPRIDÆ.

(*Cf.* Sclater, Cat. B. xiv. pp. 283-325.)

4. COTINGIDÆ.

(*Cf.* Sclater, Cat. B. xiv. pp. 327-405.)

5. PHYTOTOMIDÆ.

(*Cf.* Sclater, Cat. B. xiv. pp. 406-408.)
- 6. PHILEPITTIDÆ.

(*Cf.* Sclater, Cat. B. xiv. pp. 409-411.)

- 7. PITTIDÆ.

(*Cf.* Sclater, Cat. B. xiv. pp. 411-449.)

- 8. XENISCIDÆ.

(*Cf.* Sclater, Cat. B. xiv. pp. 450-453.)

Section C. **Tracheophonæ.**

## Fam. 1. DENDROCOLAPTIDÆ.

(*Cf.* Sclater, Cat. B. xv. pp. 2-175.)

2. FORMICARIIDÆ.

(*Cf.* Sclater, Cat. B. xv. pp. 176-336.)

3. PTEROPTOCHIDÆ.

(*Cf.* Sclater, Cat. B. xv. pp. 337-352.)

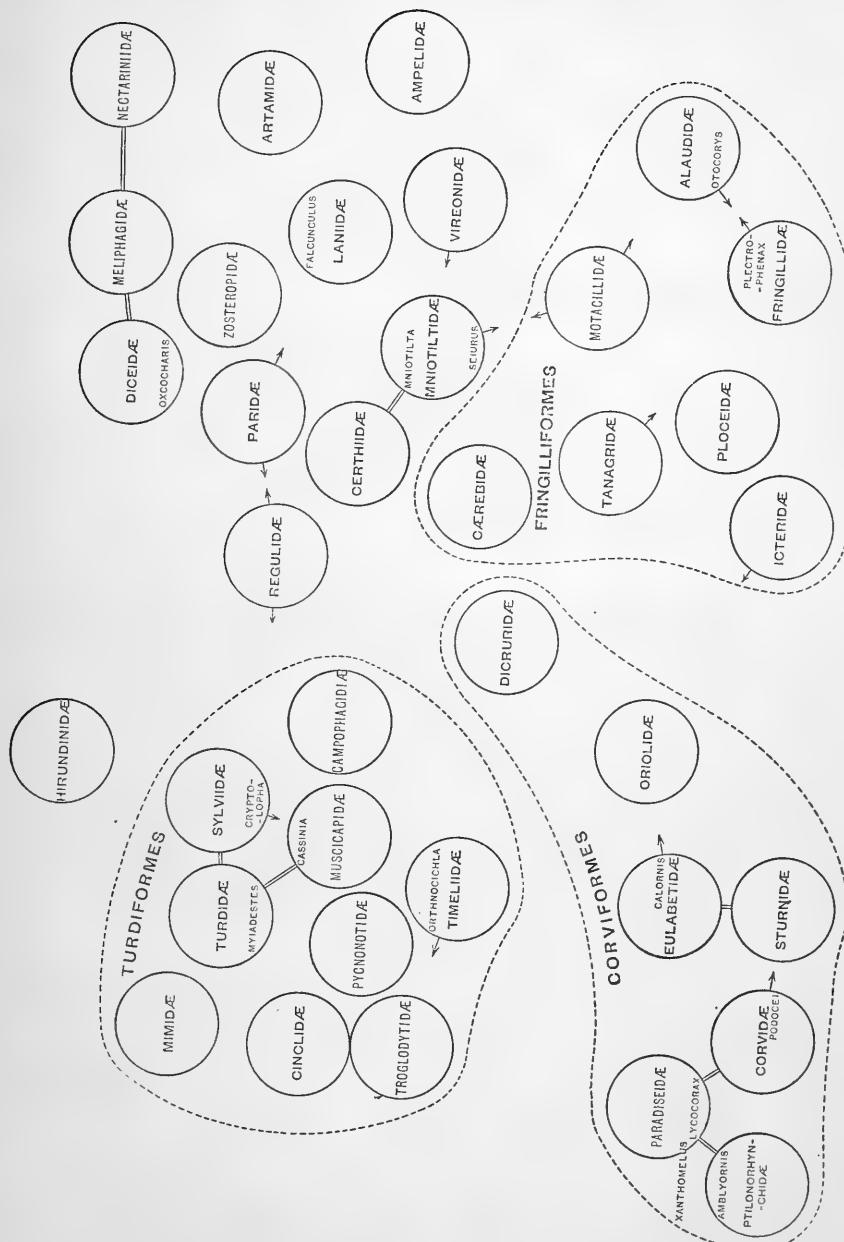
Section D. **Atrichiidæ\***.

The accompanying Map (Plate XI.), which is a modification of my arrangement of 1890, will give some idea of the affinities of the Oscines, as I conceive them. I should have been glad, had time permitted, to have attempted a more definite diagnosis of the families of Passeres, after the manner of Mr. Seeböhm; but this is a work which will require much thought and labour, and more leisure than I have at my command at present. It has been in fact very fortunate for me that Mr. Seeböhm has published his summary of diagnostic characters for the higher Orders and Groups of Birds, and that so much has been likewise done in this direction by Dr. Stejneger, for I should never have had time to compile these facts myself; and, even now, in most cases I have not been able to verify my references. But I hope to be able to attack the subject again at some future time, and I merely put forward my present scheme as a kind of foundation for future investigation.

The study of the natural classification of Birds is a most absorbing one, and will well repay any ornithologist who pursues this line of

\* Intrinsic muscles of the voice-organ fixed to the end of the bronchial semi-rings; sciatic artery present; furcula rudimentary. (*Cf.* Sharpe, Cat. B. Brit. Mus. xiii. p. 659.) By the removal of the *Menuræ* as a separate group of birds, the *Atrichiidæ* stand alone. It is hardly likely that they possess the downy nestling of *Menura*, and they are at present, therefore, the sole representatives of the *Passeres Abnormales* of Garrod (P. Z. S. 1876, p. 518).

## PLATE XI.



investigation ; but it is certainly not a subject which should be attacked in a hurry. On the contrary, it seems to me that years of close application are necessary for an acquisition of the requisite knowledge, before anyone can venture to speak with authority concerning the natural arrangement of Birds. I am, moreover, certain that a lifetime is necessary to master the subject in all its details, and I would point out what the study of systematic ornithology means to a man who sets himself to acquire an actual knowledge of every species of bird. By working very hard for 300 out of 365 days in a year, and by burning much midnight oil, it is just possible to describe and to work out the synonymy of *one* species a day—not more. That is the average which a man can attain to by very close application ; and if he can describe and collect together the synonymy of 300 species every year, it will be good work indeed. Of course I mean taking one species with another into consideration ; and it will surprise any one who has not gone deeply into the subject to find what a mass of synonymy belongs to even an African or Indian species, and what a long time it takes to verify the references. I have had, as you will all admit, some experience of systematic work with the ' Catalogue of Birds,' and this is the result of my calculations—that a man can hope to acquire some practical knowledge of species and their literature by unswerving application to work for forty years ! This will leave him but little leisure either for the study of comparative anatomy or osteology ; and it is evident that a comprehensive work on the comparative osteology of birds would be extremely useful at the present time. It is to be hoped, as I said before, that Dr. Shufeldt or some equally competent anatomist will consider the advisability of publishing a ' Handbook of Avian Osteology,' but to be of use it must be diagnostic.

The publication of the ' Catalogue of Birds ' will, I trust, render it unnecessary in the future to spend weeks and months in the hunting up of synonymy. This part of the ground at least has been cleared, and the student of the next generation will benefit by the drudgery which so many of us have had to perform in our day. To return, in conclusion, to my simile of "brick" building (*anteà*, p. 56), I may add a hope that this *réunion* of Ornithologists, and the interchange of ideas which is taking place between us, will strengthen the bond of sympathy which exists between ornithologists all over the world, and that the outcome of the session of the Second Ornithological Congress in this beautiful and hospitable city of Budapest will result in the contribution of many "bricks" towards the completion of the great Ornithological structure which we have in hand. If the present Address be considered as adding even ever so little towards the consummation of our hopes, the present speaker will feel more than satisfied.

PLATE XII.

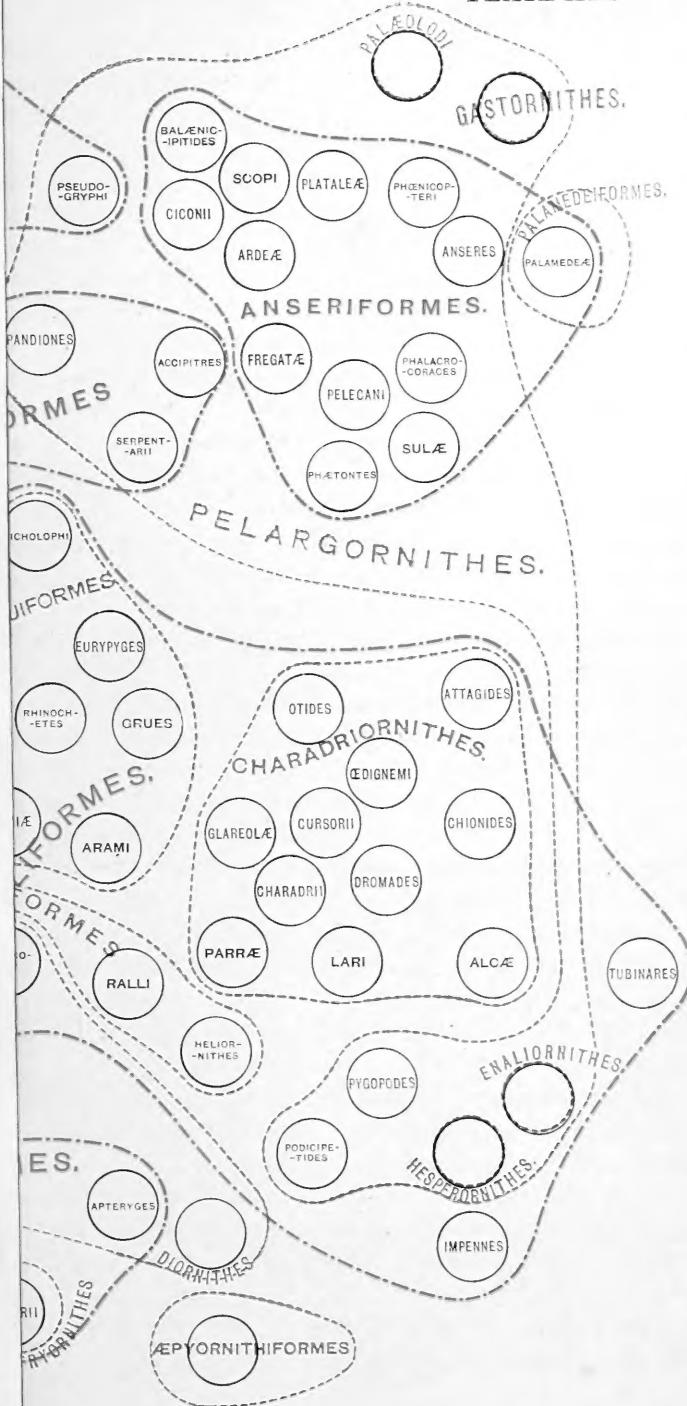




PLATE XII

